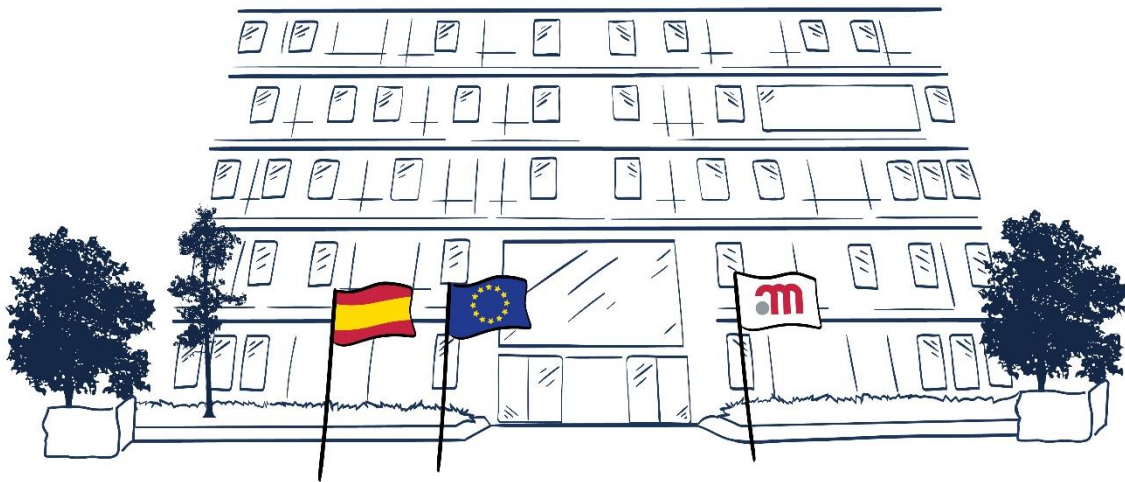


Why Pharmacogenomics is important for public health

24-09-2024



María Jesús Lamas PhD
Director of the Spanish Agency for
Medicines and Medical Devices



Adverse drugs reactions (ADR)

**5-10% of
hospital
admissions**

**Between 4th
and 6th most
common
cause of
death**

Lazarous, JAMA 1998



**197,000
annual
deaths**

**42 billion
dollars
worldwide**



**1% of all
health care
expenditure
worldwide**



**5% of
hospital
patients**

**5th most
common
cause of
hospital
death**

Zazzara, et al., Eur Geriatr Med, 2021

World Health Organization (WHO). WHO launches global effort to halve medication-related errors in 5 years. 2017

(EC) No. 726/2004. Impact assessment. 2008; I: 12

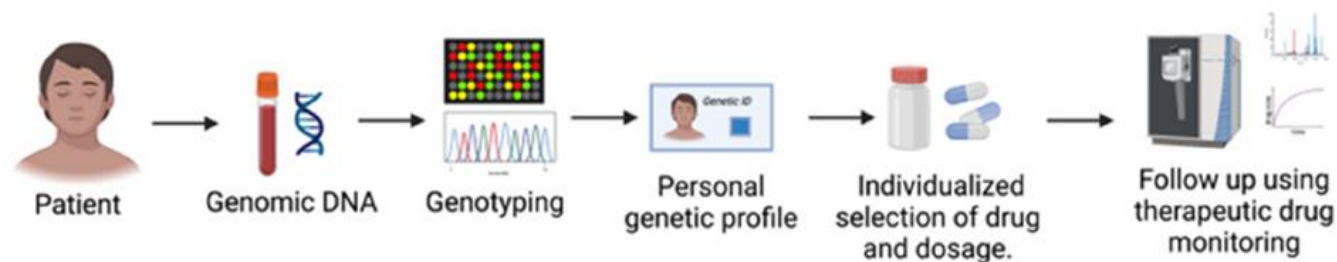


**Aging is associate with polypharmacy, polypharmacy
increases risk of ADRs**

O'Shea et al., The Pharmacogenomics Journal, 2022



Pharmacogenomics



Jukic et al., Trends in pharmacological science, 2022

Gene → protein $\left\{ \begin{array}{l} \text{druggable target} \\ \text{metabolizer} \end{array} \right.$

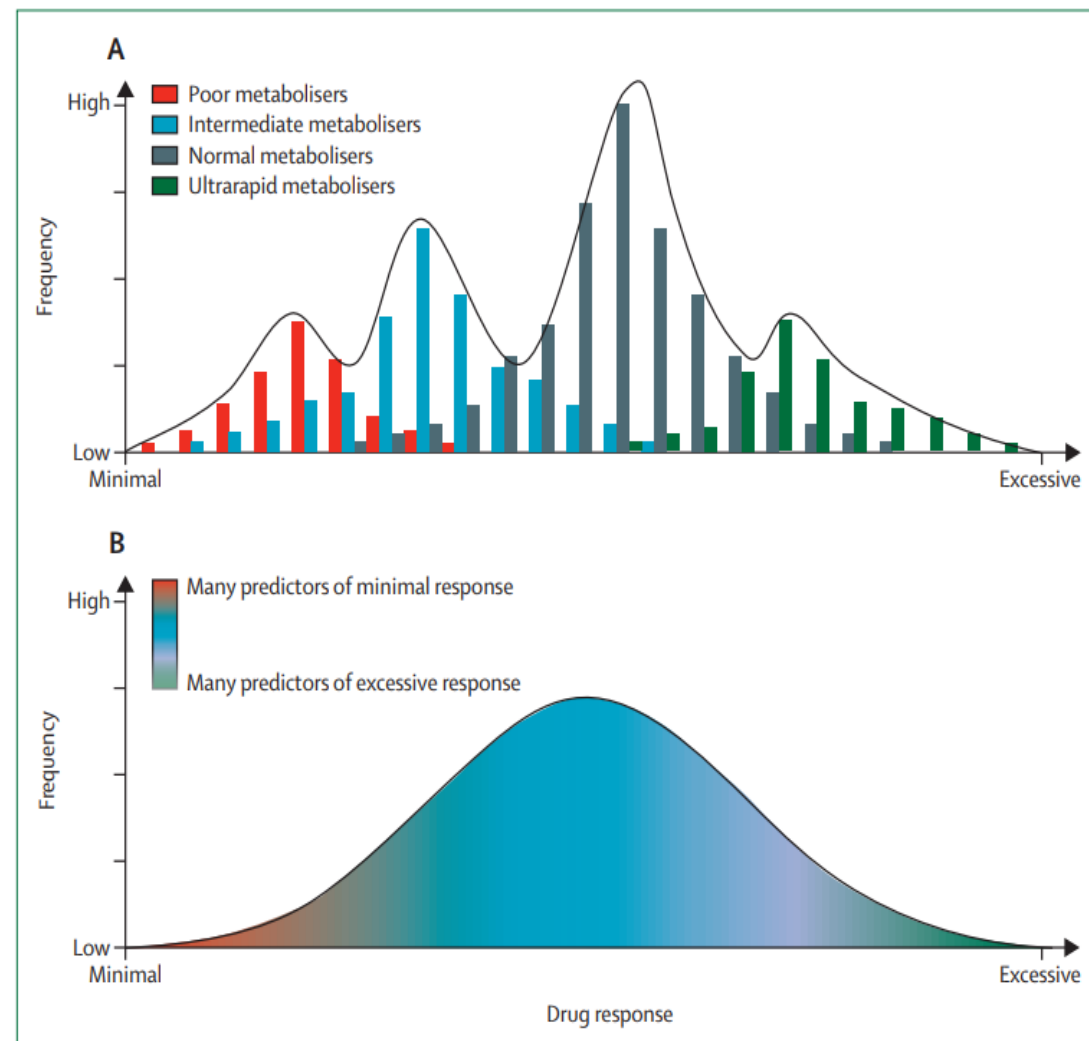
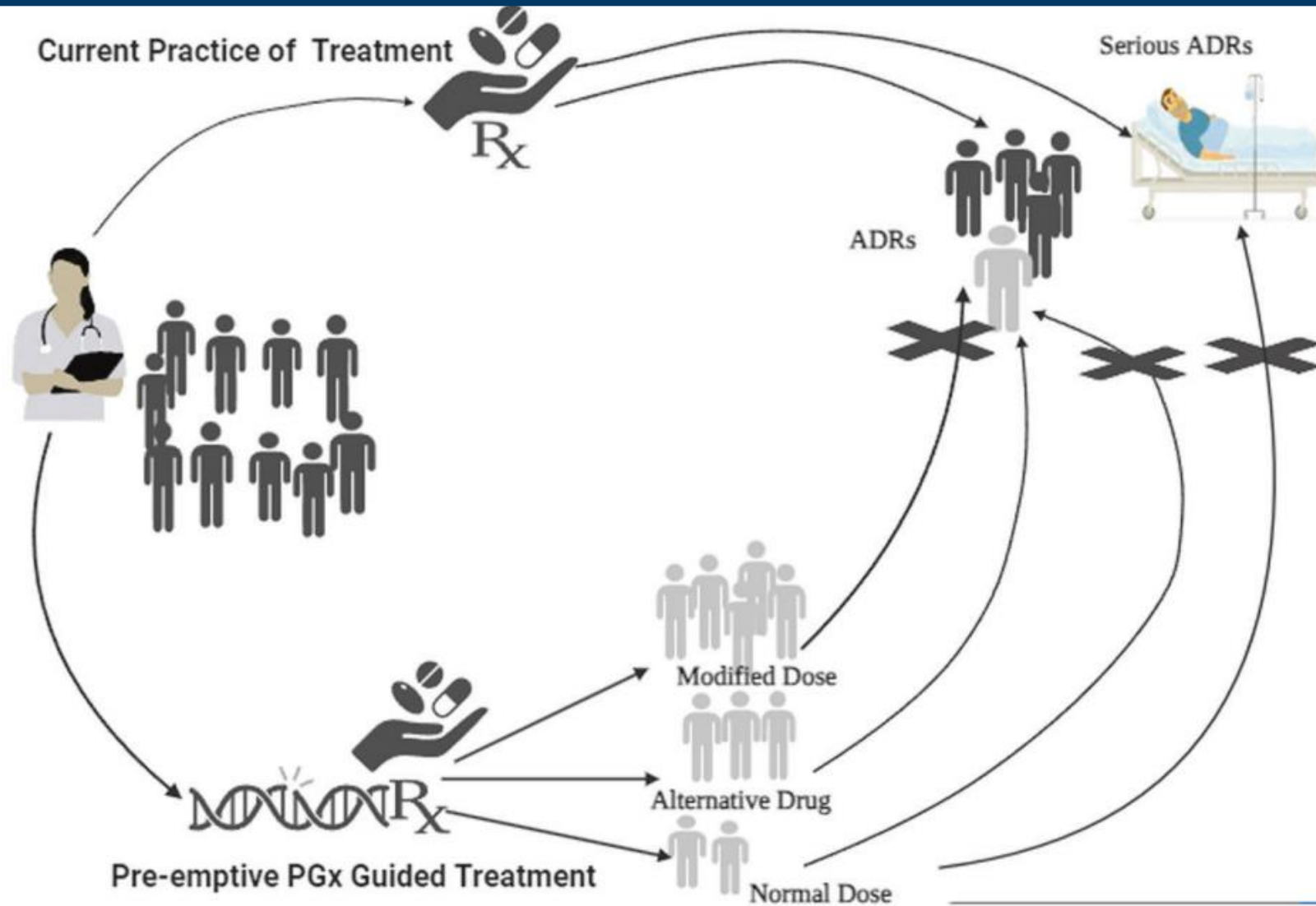


Figure 1: Profile of drug responses as influenced by a single pharmacogene variant (A) or multiple gene variants (B)

M Roden et al., Lancet, 2019



Patient treatment implementing pharmacogenomics testing



Chenchula et al., The pharmacogenomics journal, 2024



Impact of preemptive pharmacogenomic testing

PREemptive Pharmacogenomic Testing for Preventing Adverse Drug REactions (PREPARE)

ClinicalTrials.gov ID **NCT03093818**

Sponsor J.J.Swen

Information provided by J.J.Swen, Leiden University Medical Center (Responsible Party)

Last Update Posted 2024-04-19

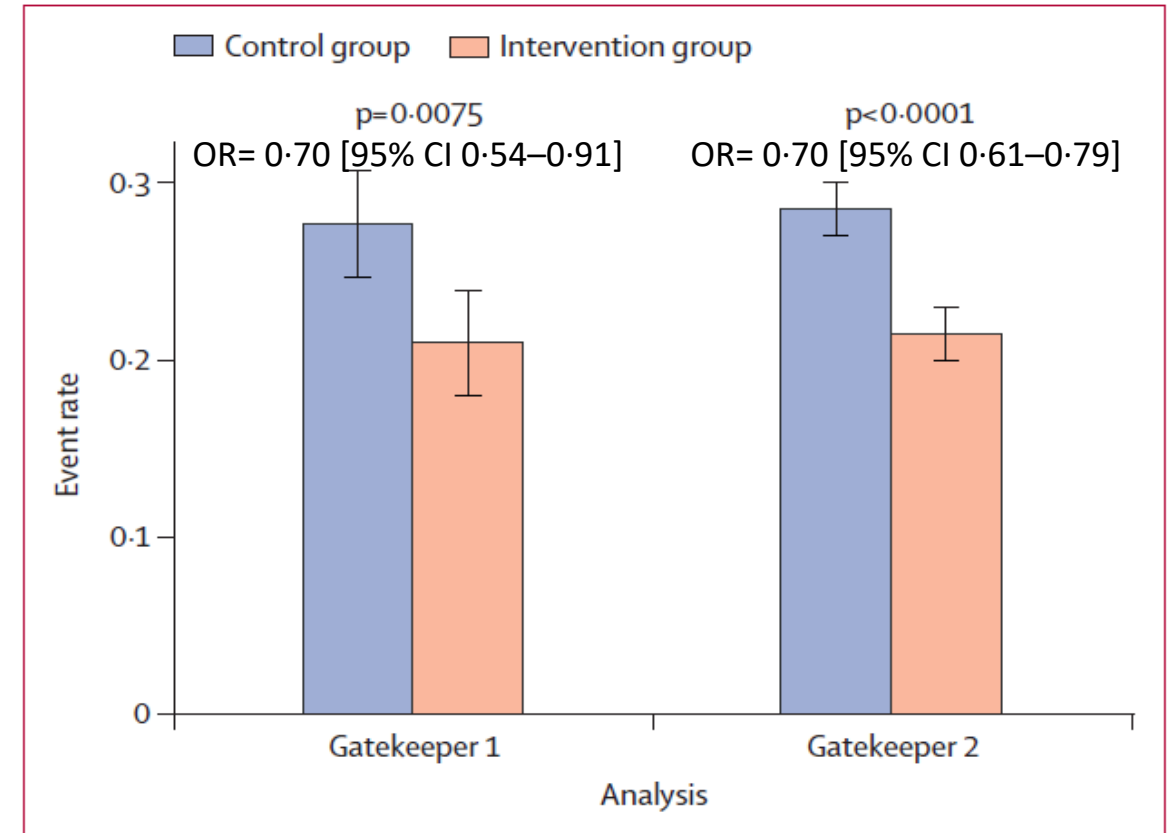
12-gene pharmacogenomic panel – 50 variations

7 countries, 6.944 patients enrolled

Standard treatment vs DPWG recommendation-guided

Outcome: causal relevant ADR in 12 wks

25,2 % patients had an actionable variant



Swen, van der Wouden, Manson et al., The lancet, 2023



Pharmacogenomics impact on healthcare associated costs

Journal of Medical Economics Vol. 19, No. 3, 2016, 213–228

1369-6998

doi:10.3111/13696998.2015.1110160

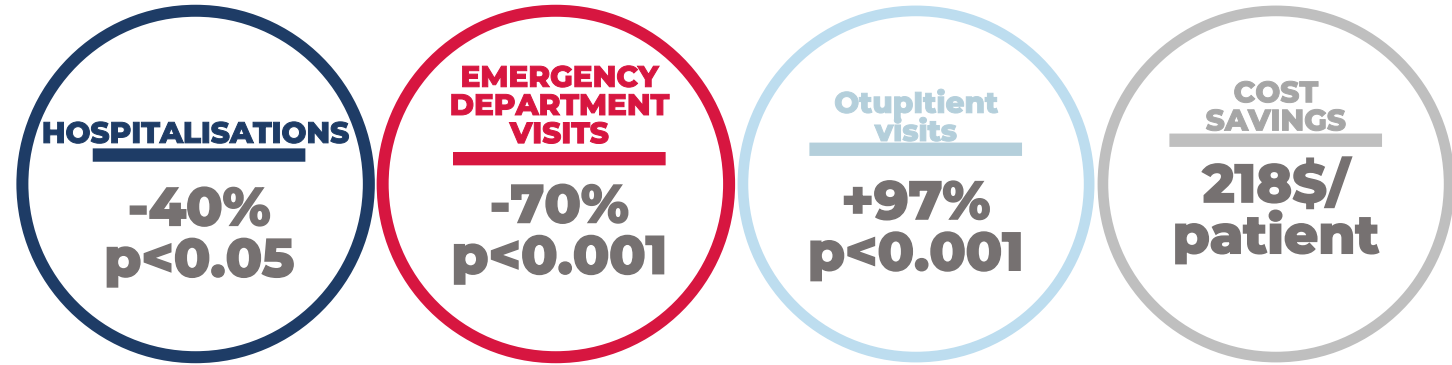
Article 0139.R1/1110160

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Original article

The effect of pharmacogenetic profiling with a clinical decision support tool on healthcare resource utilization and estimated costs in the elderly exposed to polypharmacy

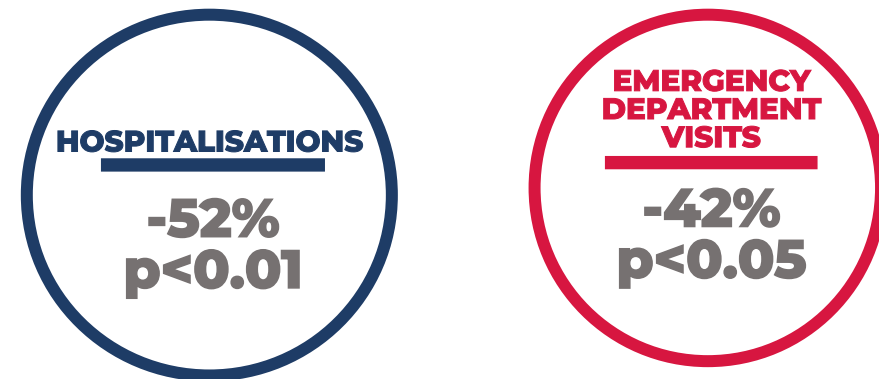
Brixner, Journal of Medical Economics, 2016



RESEARCH ARTICLE

Clinical impact of pharmacogenetic profiling with a clinical decision support tool in polypharmacy home health patients: A prospective pilot randomized controlled trial

Elliott et al., PLOS ONE, 2017





 **frontiers** | Frontiers in Pharmacology

Cost-Effectiveness of Pharmacogenomics-Guided Prescribing to Prevent Gene-Drug-Related Deaths: A Decision-Analytic Model

Cathelijne H. van der Wouden¹, Heiralde Marck¹, Henk-Jan Guchelaar¹, Jesse J. Swen¹ and Wilbert B. van den Hout^{2}*

**COST
SAVINGS**

Cost-
effectiveness
**51.000\$/
prevented
death**

Pharmacogenomics and Personalized Medicine

Dovepress

open access to scientific and medical research

 Open Access Full Text Article

ORIGINAL RESEARCH

Initial assessment of the benefits of implementing pharmacogenetics into the medical management of patients in a long-term care facility

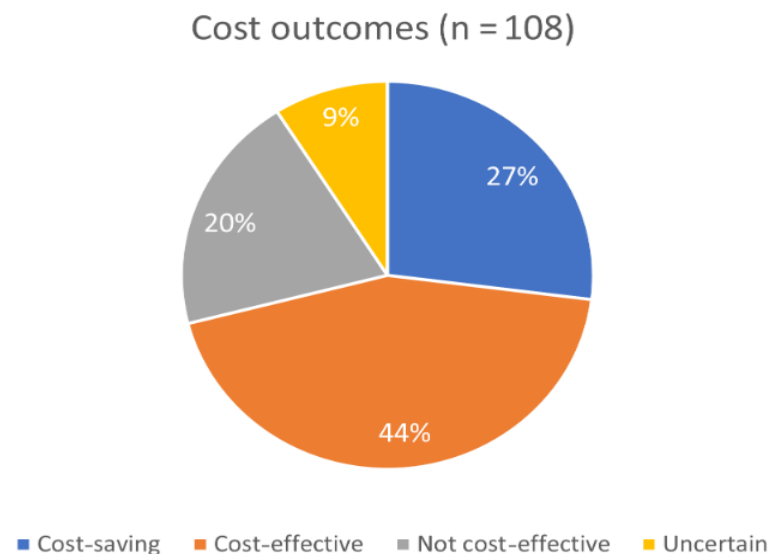
Saldivar et al., Pharmacogenomics and Personalized Medicine, 2016

**COST
SAVINGS**

**621\$
annual/
patient**

ARTICLE

Cost Effectiveness of Pharmacogenetic Testing for Drugs with Clinical Pharmacogenetics Implementation Consortium (CPIC) Guidelines: A Systematic Review

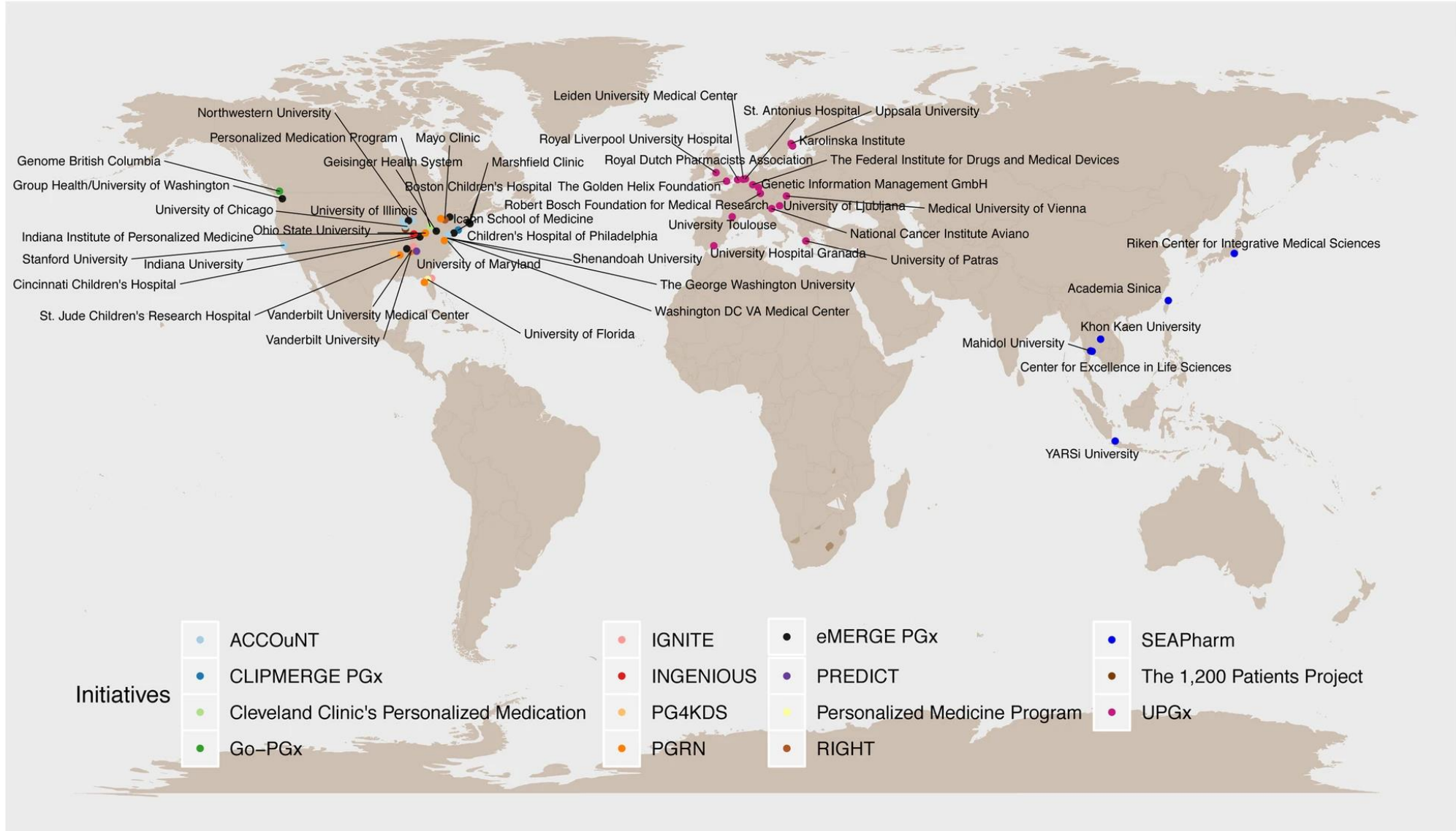


Morris et al., Clinical Pharmacology & Therapeutics, 2022

- 108 studies included
- Quality of Health Economic Studies (QHES) (assess robustness)
- 39 drugs
- Clopidogrel (22/23 CE-CS)
- Warfarin (7/16 CE-CS)
- HLA* (Abacavir, allopurinol, Carbamazepine/phenytoine) (15/26 CE-CS)
- Antidepressants (9/11 CE-Cs)

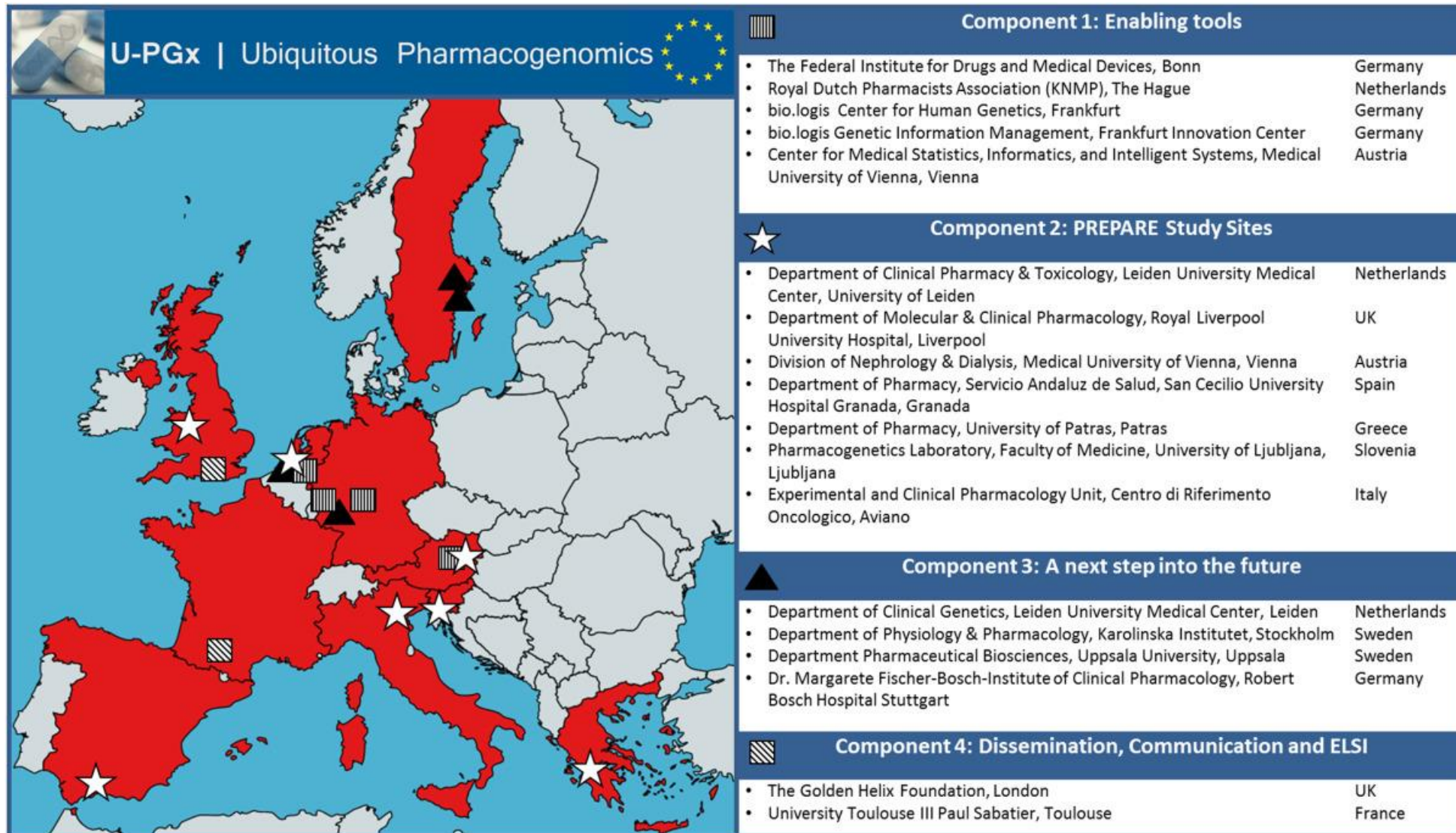


Pharmacogenomic global implementation



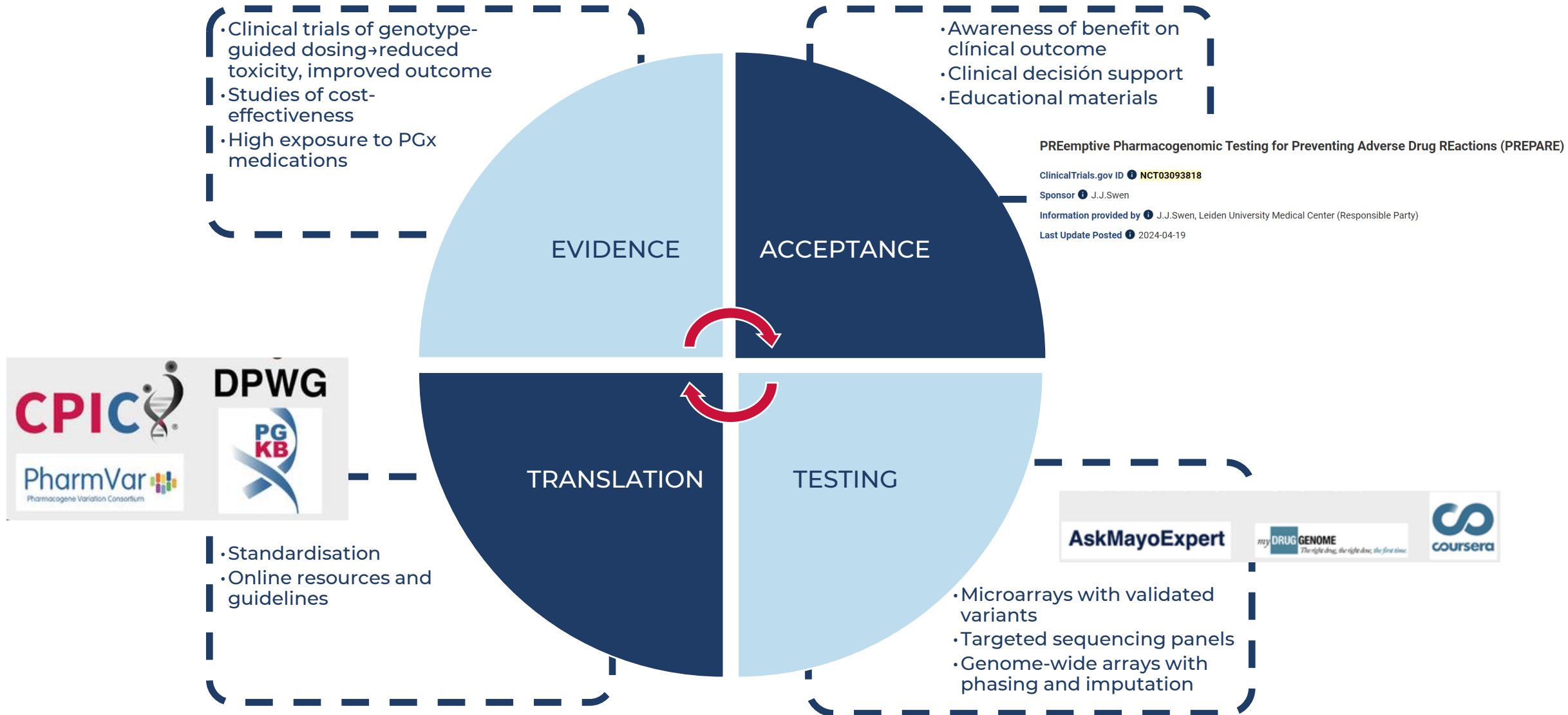


Preemptive pharmacogenomic testing antecedents in Europe





Solutions for barriers to pharmacogenomics





Solutions for barriers

Actionable recommendations for individual drug-gene interactions

CPIC

60

DPWG

55

Public pharmacogenetics databases



Expected



Currently available





Solutions for barriers to pharmacogenomics


EUROPEAN MEDICINES AGENCY
SCIENCE · MEDICINES · HEALTH

16 December 2021
EMA/447502/2021

European Medicines Regulatory Network Data
Standardisation Strategy



Adoption by Big Data Steering Committee	16 September 2021
Adoption by European Network Data Board	8 October 2021
Endorsed by Heads of Medicines Agencies	24 November 2021
Endorsed by EMA Management Board	15-16 December 2021

See websites for contact details

Heads of Medicines Agencies www.hma.eu
European Medicines Agency www.ema.europa.eu

The European Medicines Agency is
an agency of the European Union 

- Integrate –omics in Pharmacovigilance
- Dedicated biobanks
- linkage of genomic data with electronic health records → RWE

Standards for safety and risk management:

A revision of the standard ISO ICH E2B(R3) could enable omics (gen**omics**, prote**omics** and metabol**omics**) data of patients to be included in ICSRs (Individual case suspected reactions) → Precision pharmacovigilance



Spanish pharmacogenomics biomarkers database



agencia española de
medicamentos y
productos sanitarios

English



AEMPS ▾ Medicines for human use ▾ Veterinary medicines ▾ Medical devices ▾ Cosmetics ▾ Biocides and personal care products ▾

Press ▾ Pharmaceutical Industry ▾ Healthcare Professionals ▾ Citizens ▾ CNCps



Base de datos de biomarcadores farmacogenómicos

Inicio > Medicamentos de uso humano > Base de datos de biomarcadores farmacogenómicos

Fecha de publicación: 29 de julio de 2024

Con la finalidad de facilitar la consulta de la información contenida en Fichas Técnicas para promover la implementación de la farmacogenética en la práctica clínica, la AEMPS publica la [base de datos de biomarcadores farmacogenómicos](#). La tabla facilita el acceso a la información regulatoria disponible y en un futuro próximo a las recomendaciones establecidas para cada principio activo. Esta herramienta es de vital importancia a raíz de la actualización de la cartera de servicios genómicos para el SNS, aprobada el 23 de junio de 2023 por el Ministerio de Sanidad y posteriormente ratificada por el Consejo Interterritorial del SNS. Será de ayuda para la aplicación de la Medicina Personalizada de Precisión en el SNS, a partir de la implementación de la farmacogenética en la clínica. Esta estrategia permitirá seleccionar los fármacos más adecuados según las necesidades y el perfil genético de cada paciente, con el fin último de optimizar la eficacia y reducir el riesgo de efectos adversos.



Cómo usar la base de datos



Estructura de la base de datos



Evidencia de la asociación fármaco/biomarcador



Criterios para la inclusión de biomarcadores



Base de datos

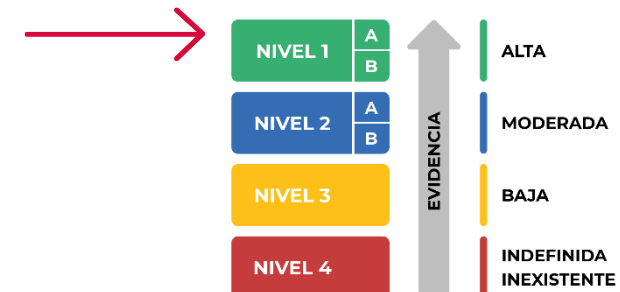
Base de datos de biomarcadores farmacogenómicos

Escribe para filtrar

Principio activo	Código ATC	Biomarcador	Biomarcador subgrupo implicado
abacavir	J05AF06	HLA-B	HLA-B*57:01 alelo positivo
Sección en Ficha Técnica: 4.1 Indicaciones terapéuticas 4.4 Advertencias y precauciones especiales de empleo Descripción de la información de la relación principio activo-biomarcador: (4.1) Antes de iniciar el tratamiento con abacavir, se debe llevar a cabo una prueba de detección del alelo HLA-B*57:01 en los pacientes infectados por el VIH, independientemente del origen racial. Abacavir no se debe emplear en pacientes portadores del alelo HLA-B*57:01. (4.4) El riesgo de que ocurran RHS con abacavir es alto para pacientes portadores del alelo HLA-B*57:01. Incluido en Cartera de Servicio Nacional: Sí			
acenocoumarol	B01AA07	VKORC1	c.-1639G>A
alopurinol	M04AA01	HLA-B	HLA-B*58:01 alelo positivo
amikacina	J01GB06	MT-RNR1	c.1555A>G
amitriptilina	N06AA09	CYP2C19	Metabolizadores lentos
amitriptilina	N06AA09	CYP2D6	Metabolizadores lentos
aripirazol	N05AX12	CYP2D6	Metabolizadores lentos
atazanavir	J05AE08	CYP2C19	Metabolizadores intermedios o lentos en tratamiento concomitante con voriconazol y ritonavir

<< < 1 2 3 4 5 > >>

Evidencia de la relación biomarcador genético / dato clínico





Future objectives and opportunities



Researchers: Utilize multimodal algorithms, explore genotyping technologies. Generate real-world evidence for better drug response predictability.



Regulators: include variants information in pharmacovigilance. (Standardization)



Consortiums: Develop guidelines that formulate recommendations in the context of polytherapy and the influence of several genes.



Health systems: Link -omics to eHR. Make possible compelling evidence. Actively implement pharmacogenomics within clinical systems to improve effectiveness and safety



Thank you for your attention!

sdaem@aemps.es

[Agencia Española de Medicamentos y Productos Sanitarios \(aemps.gob.es\)](http://aemps.gob.es)