Pharmacogenetics (PGx) and Personalized Medicine

Personalized Medicine Using Genetic Testing Increases Effectiveness and Reduces Risk of Drug Therapy

Each Person Responds Differently To Medications

At the molecular level, certain genes are responsible for how the body processes different medications.

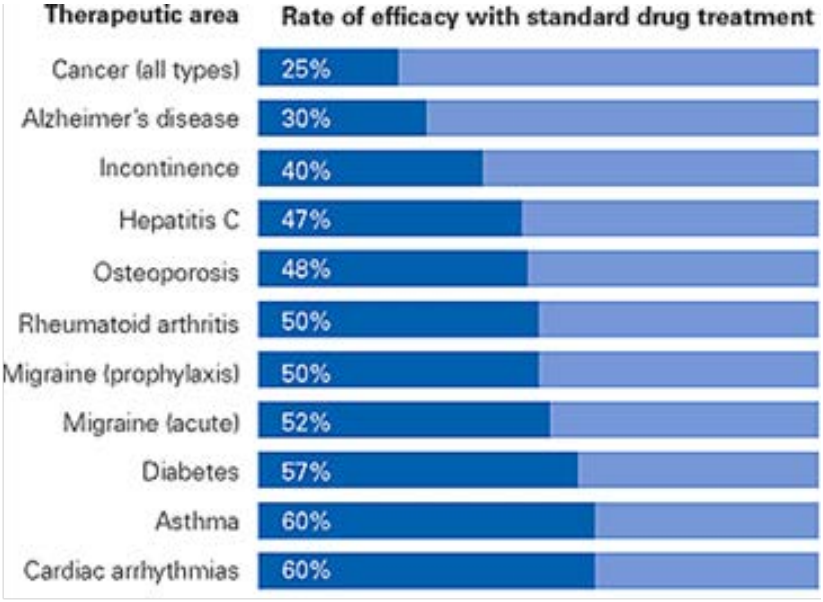
Pharmacogenomics combines our understanding of medication metabolism with genetics.

Genetic variations may determine the effectiveness or potential side effects of a specific medication.

Genetic Testing Provides:

- Identification of Effective Therapies
- Guidance Regarding Dosing
- Reduction of Potential Side Effects

Drug Effectiveness and Risks



- Only a percentage of the patient population will respond to a particular drug treatment.
- Adverse drug reactions are the 4th leading cause of death.
- Lack of patient response or potentially serious adverse effects leads to wasted therapy efforts.
- By predicting the outcome of a therapy through genetic testing, patients receive a personalized approach that increases effectiveness and reduces risk of the medication(s).

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Otogenetics Pharmacogenomics Gene Panel

The Otogenetics Pharmacogenomics Panel sequences genes associated with drug metabolism. It is designed to provide genotype-based prescribing recommendations to help select the best drug and dosage for each individual.

Who Should Be Tested?

- Patients who will receive medications that have pharmacogenomics biomarkers indicated in their labeling.
- Patients who will receive multiple medications to evaluate risk of adverse drug reactions.

Pharmacogenetics Panels

Medical Management – 42 genes ABCB1, ABCG2, ADRA2A, ADRB1, AGT, CACNA1C, CES1, CFTR, COMT, CYP1A2, CYP2C19, CYP2C9, CYP2D6, CYP3A4, CYP3A5, DPYD, DRD1, DRD2, DRD3, EDN1, F2, F5, GNB3, GRIK1, GSTA1, HTR1A, HTR2A, HTR2C, IFNL3, KCNIP1, LDLR, MTHFR, NAT1, NR1H3, OPRM1, RYR1, SLC6A2, SLCO1B1, TPMT, UGT2B10, UGT2B7, VKORC1

Cardiovascular - ABCG2, CACNA1C, CYP2C19, CYP2C9, CYP2D6, CYP3A4, Factor II, Factor V, MTHFR, SLCO1B1, VKORC1

Mental Health - ADRA2A, COMT, CYP1A2, CYP2C19, CYP2D6, DRD2, GRIK4, HTR2A, MTHFR, OPRM1

Pain Management - COMT, CYP1A2, CYP2C19, CYP2C9, CYP2D6, OPRM1

Oncology – ABCB1, CYP2D6, CYP3A4, CYP3A5, COMT, DPYD, MTHFR, OPRM1, SLCO1B1, TPMT

Thrombosis Risk - F2, F5

GENE LIST						
ABCB1	CES1	CYP2D6	DRD3	GSTA1	LDLR	SLC6A2
ABCG2	CFTR	CYP3A4	EDN1	HTR1A	MTHFR	SLCO1B1
ADRA2A	COMT	CYP3A5	F2	HTR2A	NAT1	TPMT
ADRB1	CYP1A2	DPYD	F5	HTR2C	NR1H3	UGT2B10
AGT	CYP2C9	DRD1	GNB3	IFNL3	OPRM1	UGT2B7
CACNA1C	CYP2C19	DRD2	GRIK1	KCNIP1	RYR1	VKORC1

DRUG CLASS		
ADHD	Benzodiazepines	Muscle Relaxants
Antiarrhythmics	Chemotherapeutics	NSAIDs
Anticoagulants	Corticosteriods	Opioids
Antidepressants	CFTR	Platelet Aggregation Inhibitors
Antidiabetics	General Anesthetics	Proton Pump Inhibitors
Antiepileptics	Hepatitis Antivirals	Statins
Antihypersensitives	HIV/AIDS	Thrombophilia
Antipsychotics	Immunosuppressants	

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Explanation of Test Results

PGx Pharmacogenetics Test Report Provides Results In Three Sections:

1. Quick Summary 2. Gene Summary 3. Detailed Information

1. QUICK SUMMARY

This Quick Summary provides a brief overview of the predicted response of the patient to specific medications in the different categories. This information is based solely on the genotype information and is not based on a complete patient profile. Detection or absence of variants does not replace the need for therapeutic monitoring. Physicians should consider the information provided in the Details section, as well as consider current prescriptions, family history, presenting symptoms, and other factors before making any clinical or therapeutic decisions.

The predicted response of the patient to specific medications is indicated using the following representations:

No negative assertions based on genotype.

Genotype may present increased risk or decreased effectiveness; prescribe with caution.

Genotype may present increased risk or decreased effectiveness; select alternative drug.

2. GENE SUMMARY

This section shows the genes which were analyzed based on their pharmacogenetic association to specific pharmaceuticals. Correlations with the gene(s) analyzed, the patient's genotype and phenotype are tabulated.

Findings are reported as three categories:

Extensive (Normal) Metabolizer or Normal Stimulant Response

Intermediate Metabolizer or Slightly Reduced Stimulant Response

Ultrarapid Metabolizer or Increased Disorder Risk

3. DETAILED INFORMATION

Each medication is categorized alphabetically according to the gene(s) evaluated, the relevant genotype, phenotypical conclusions, along with variant-drug evidence as documented in scientific literature.

The Variant-Drug Evidence is represented as follows:

Replicated in multiple studies with statistical significance and strong effect size.

Replicated in multiple studies with and without statistical significance and effect size may be minimal.

Not yet replicated or replicated, but lacking clear evidence of an association.

Notable information is available and special considerations may be of interest when prescribing for this genotype.

Literature does not indicate additional risks, benefits, or prescription changes to consider for this genotype.

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CARDIOVASULAR	
Atherosclerotic Heart Disease of Native Coronary artery	
ICD10 CODE	**DESCRIPTION**
I25.10	w/o angina pectoris
I25.110	w unstable angina pectoris
I25.111	w angina pectoris w documented spasm
I25.118	w other forms of angina pectoris
Atherosclerosis of Autologous artery Coronary artery Bypass Graft(s)	
I25.71	w angina pectoris w documented spasm
I25.720	w unstable angina pectoris
Atherosclerosis of Autologous Vein Coronary artery Bypass Graft(s)	
I25.710	Unstable angina pectoris
I25.711	Angina pectoris w documented spasm
I25.718	Other forms of angina pectoris
I25.719	Unspecified angina pectoris
Atherosclerosis of Nonautologous Biological Coronary artery Bypass Graft(s)	
I25.731	Angina pectoris w documented spasm
I25.738	Other forms of angina pectoris
I25.739	Unspecified angina pectoris
Atherosclerosis of Native Coronary artery of Transplanted Heart	
I25.750	Unstable angina
I25.751	Angina pectoris w documented spasm
I25.758	Other forms of angina pectoris
I25.5	Ischemic cardiomyopathy
I25.6	Silent myocardial ischemia
125.728	Atherosclerosis of autologous artery coronary bypass graft(s) w other forms of pectoris angina
I25.60	Atherosclerosis of bypass graft of coronary artery of transplanted heart w unstable angina
I25.810	Atherosclerosis of coronary artery bypass graft(s) w/o angina pectoris
I25.811	Atherosclerosis of bypass graft of coronary artery of transplanted heart w/o angina pectoris
I25.83	Coronary atherosclerosis due to lipid rich plaque
I25.84	Coronary atherosclerosis due to calcified coronary lesion
I25.89	Other forms of chronic ischemic heart disease
I25.9	Chronic ischemic heart disease, unspecified
Atherosclerosis of Bypass Graft of Coronary artery of Transplanted Heart	
I25.761	Angina pectoris w documented spasm
I25.768	Other forms of angina pectoris
I25.769	Unspecified angina pectoris
Unspecified Angina Pectoris Atherosclerosis of Other Coronary artery Bypass Graft(s)	
125.790	Unstable angina pectoris
125.791	Angina pectoris w documented spasm
I25.798	Other forms of angina pectoris
Z79.01	Longterm (current) use of anticoagulants
Z79.02	Longterm (current) use of antithrombotics/antiplatelets
CARDIOVASCULAR OTHER	
D68.2	Hereditary deficiency of other clotting factors
I10	Essential (primary) hypertension
I25.9	Chronic ischemic heart disease, unspecified
I48.91	Unspecified atrial fibrillation
I50.9	Heart failure, unspecified
I82.91	Chronic embolism and thrombosis, unspecified vein
R03.0	Elvtd blood pressure read, w/o diag of hypertension
I20.0	Unstable angina
I20.1	Angina pectoris w documented spasm
I20.8	Other forms of angina pectoris
I20.9	Angina pectoris, unspecified
I21.09	STEMI Other coronary artery anterior wall
I21.3	ST elevation (STEMI) MI of unspecified sites

MENTAL HEALTH	
Major Depressive Affective Disorder Recurrent Episode	
F32.9	Major depressive disorder, single episode, unspecified
F33.9	Unspecified
F33.0	Mild
F33.1	Moderate
F33.2	Severe w/o psychotic features
F33.3	Severe w/ psychotic features
F33.41	In partial remission
F33.42	In full remission
Bipolar I Disorder Most Recent Episode (or Current) DEPRESSED	
F31.30	Unspecified
F31.31	Mild
F31.32	Moderate
F31.4	Severe w/o psychotic features
F31.5	Severe, w/psychotic features
F31.75	In partial remission
F31.76	In full remission
Bipolar I Disorder, Most Recent Episode (or Current) MIXED	
F31.60	Unspecified
F31.61	Mild
F31.62	Moderate
F31.63	Severe, w/o psychotic features
F31.64	Severe, w psychotic features
F31.77	In partial remission
F31.78	In full remission
Other	
F32.9	Major depressive disorder, single episode, unspecified
F41.9	Anxiety disorder, unspecified
F90.9	Attention deficit hyperactivity disorder, unspecified
PAIN	
Z79.891	Longterm (current) use of opiate analgesic
Z79.899	Other longterm (current) drug therapy
G10	Huntington's disease
G89.4	Chronic pain syndrome
M12.9	Arthropathy, unspecified
M15.9	Polyosteoarthritis, unspecified
M25.50	Pain in unspecified joint
M25.569	Pain in unspecified knee
M54.5	Low back pain
M60.9	Myositis, unspecified
M79.1	Myalgia
M79.609	Pain in unspecified limb
M79.7	Fibromyalgia
ENDOCRINE	
E03.9	Hypothyroidism, unspecified
E10.9	Diabetes I mellitus, w/o complications
E11.9	Diabetes II mellitus, w/o complications
OTHER	
R06.02	Shortness of breath
R11.2	Nausea with vomiting, unspecified
R51	Headache