4U Health

PATIENT INFORMATION
NAME: DEMO PATIENT
DOB: 31/Jan/2024
SEX AT BIRTH: Male

SPECIMEN DETAILS
BARCODE: 50000
SAMPLE ID: 50000
TYPE: SWAB
COLLECTED: 31/Jan/2024

ORDERED BY
DEMO, PHYSICIAN (4U HEALTH)
GENERATED: 11/Mar/2024

This pharmacogenetic information is based on best evidence compiled from guidelines and databases including the FDA Table of Pharmacogenetic Associations, PharmGKB, Clinical Pharmacogenetics Implementation Consortium (CPIC) and Dutch Pharmacogenetics Working Group (DPWG).
Please refer to the Methods, Limitations, and Liability Disclaimer at the end of this report.

Current Medications Impacted In This Report

The medications listed below indicate the patient's **Current Medications** impacted in this report.

Clonazepam	Phenotype	Genetic Test	Results	Evidence Level
Klonopin Rivotril	Intermediate metabolizer	CYP2C9	*1/*2	Case-control studies[13]

TreatGx
ReviewGx

Implication: CYP2C9 alleles indicate increased risk of Clonazepam-related falls

Diazepam	Phenotype	Genetic Test	Results	Evidence Level
Diastat Valium	Rapid metabolizer	CYP2C19	*1/*17	FDA PGx Table[35]
	Intermediate metabolizer	CYP2C9	*1/*2	Case-control studies[13]

TreatGx
ReviewGx

Implication: CYP2C9 alleles indicate increased risk of Diazepam-related falls

CYP2C19 alleles do not indicate changes from recommended dose

Escitalopram	Phenotype	Genetic Test	Results	Evidence Level
Cipralex Lexapro	Rapid metabolizer	CYP2C19	*1/*17	CPIC A[15];FDA PGx Table[35]

TreatGx
ReviewGx

Implication: CYP2C19 rapid metabolizer: increased metabolism of Escitalopram to less active compounds

Lower plasma concentrations of active drug may reduce response

2 Consider an alternative drug not predominantly metabolized by CYP2C19

Tamoxifen	Phenotype	Genetic Test	Results	Evidence Level
Nolvadex Soltamox	Ultrarapid metabolizer	CYP2D6 (Activity Score)	(*1/*1)3N	CPIC A[11];FDA PGx Table[35]

ReviewGx

Implication: CYP2D6 ultrarapid metabolizer: increased metabolism of Tamoxifen to endoxifen

Strong CPIC recommendation for breast cancer therapy: Initiate therapy with recommended standard of care dosing. Avoid moderate and strong CYP2D6 inhibitors.

2 Recommendation for conditions other than breast cancer: Risk of exaggerated response with pronounced adverse effects (He et al., 2021)

Warfarin	Phenotype	Genetic Test	Results	Evidence Level
Coumadin Jantoven	Intermediate metabolizer	CYP2C9	*1/*2	CPIC A[17];FDA PGx Table[35]
TreatGx ReviewGx	Increased response	VKORC1	A/A	CPIC A[17];FDA PGx Table[35]

Implication: 2 The algorithm in TreatGx includes pharmacogenetics and other clinical factors in calculating initial warfarin dose

Atorvastatin	Phenotype	Genetic Test	Results	Evidence Level
Lipitor	Normal function	SLCO1B1	*1/*1	CPIC A[5];FDA PGx Table[35]

TreatGx
ReviewGx

Implication: SLCO1B1 alleles indicate typical exposure to Atorvastatin

Consider prescribing desired starting dose and adjust based on disease-specific guidelines

Elagolix	Phenotype	Genetic Test	Results	Evidence Level
Orilissa	Normal function	SLCO1B1	*1/*1	FDA PGx Table[35]

ReviewGx

Implication: SLCO1B1 alleles indicate a typical response to Elagolix

* Other clinical factors, medical conditions and drug-drug interactions may contribute to medication response.

Hydrocodone	Phenotype	Genetic Test	Results	Evidence Level
Hysingla Zohydro	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	CPIC B[6]

TreatGx
ReviewGx

Implication: CYP2D6 ultrarapid metabolizer: minimal evidence for pharmacokinetic or clinical effect for Hydrocodone

No recommendation for Hydrocodone because of minimal evidence regarding adverse events or analgesia (per CPIC "no recommendation").

Ibuprofen	Phenotype	Genetic Test	Results	Evidence Level
Advil Caldolor Duexis Motrin IB NeoProfen	Intermediate metabolizer (AS 1.5)	CYP2C9 (Star Alleles)	*1/*2	CPIC A[32]

TreatGx
ReviewGx

Implication: CYP2C9 alleles do not indicate changes from recommended dose

Meloxicam	Phenotype	Genetic Test	Results	Evidence Level
Anjeso Mobic Qmiiz ODT Vivlodex	Intermediate metabolizer (AS 1.5)	CYP2C9 (Star Alleles)	*1/*2	CPIC A[32]

TreatGx
ReviewGx

Implication: CYP2C9 alleles do not indicate changes from recommended dose

4U Health

PATIENT INFORMATION
NAME: DEMO PATIENT
DOB: 31/Jan/2024
SEX AT BIRTH: Male

SPECIMEN DETAILS
BARCODE: 50000
SAMPLE ID: 50000
TYPE: SWAB
COLLECTED: 31/Jan/2024

ORDERED BY
DEMO, PHYSICIAN (4U HEALTH)
GENERATED: 11/Mar/2024

Medication Summary Table

	1 Mild or no known interaction	2 Moderate gene-drug interaction: Consider alternative medications	2 Moderate gene-drug interaction: May require an increased dose	2 Moderate gene-drug interaction: May require a reduced dose	2 Moderate gene-drug interaction: Efficacy may be affected by genetics	2 Moderate gene-drug interaction: Increased risk of adverse events	2 Moderate gene-drug interaction: See TreatGx for dose calculations	3 Medication with serious gene-drug interaction should be evaluated carefully and alternative medications should be given
Analgesia	Carisoprodol Celecoxib Flurbiprofen Hydrocodone Ibuprofen Meloxicam Piroxicam Tenoxicam		Venlafaxine		Alfentanil Fentanyl Morphine Venlafaxine			Amitriptyline Codeine Desipramine Imipramine Nortriptyline Tramadol
Autoimmune	Cyclosporine Siponimod Tacrolimus							
Cancer	Erdafitinib					Tamoxifen		
Cardiovascular	Atorvastatin Carvedilol Clopidogrel Lovastatin Nebivolol Pitavastatin Pravastatin Propranolol Rosuvastatin Simvastatin	Flecainide Metoprolol			Flecainide Metoprolol Propafenone		Fluvastatin Warfarin	
Gastroenterology	Metoclopramide		Dexlansoprazole Lansoprazole Omeprazole Pantoprazole	Dronabinol Meclizine	Meclizine	Dronabinol		Ondansetron
Infection		Voriconazole			Voriconazole			
Mental Health	Amoxapine Amphetamine Aripiprazole lauroxil Atomoxetine Fluvoxamine Protriptyline Vortioxetine	Citalopram Escitalopram Risperidone Sertraline	Venlafaxine		Citalopram Escitalopram Risperidone Venlafaxine	Alprazolam Aripiprazole Asenapine Brexpiprazole Bromazepam Cariprazine Chlordiazepoxide		Amitriptyline Clomipramine Desipramine Doxepin Imipramine Nortriptyline Paroxetine

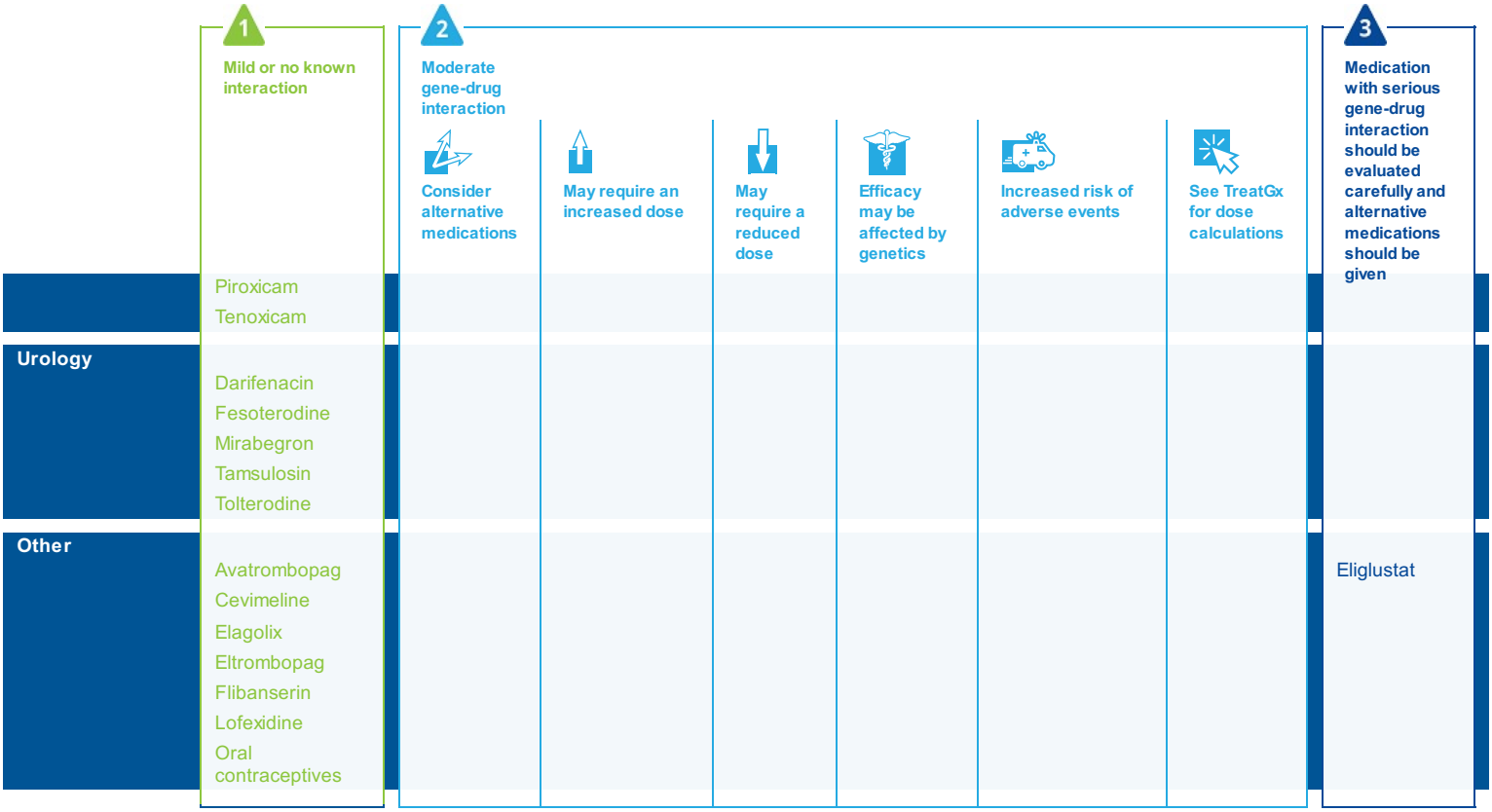
4UHEALTH | Vision Lab Director: Lekh Sharma, PhD, TC (NRCC) | 4U Health: PO Box 100083 Pittsburgh, PA 15233
866-610-1200 | help@4uhealth.com | www.4uhealth.com

	1 Mild or no known interaction	2 Moderate gene-drug interaction: Consider alternative medications	2 Moderate gene-drug interaction: May require an increased dose	2 Moderate gene-drug interaction: May require a reduced dose	2 Moderate gene-drug interaction: Efficacy may be affected by genetics	2 Moderate gene-drug interaction: Increased risk of adverse events	2 Moderate gene-drug interaction: See TreatGx for dose calculations	3 Medication with serious gene-drug interaction should be evaluated carefully and alternative medications should be given
						Chlorpromazine Clobazam Clonazepam Clorazepate Clozapine Diazepam Flupentixol Fluphenazine Flurazepam Haloperidol Iloperidone Lorazepam Loxapine Lurasidone Methotrimeprazine Molindone Nitrazepam Olanzapine Oxazepam Paliperidone Perphenazine Pimozide Prochlorperazine Promethazine Quetiapine Temazepam Thioridazine Triazolam Trifluoperazine Ziprasidone		Trimipramine Zuclopenthixol
Neurology	Brivaracetam Deutetrabenazine Donepezil Fosphenytoin Galantamine Phenytoin Propranolol Tetrabenazine Valbenazine	Metoprolol	Venlafaxine		Metoprolol Venlafaxine	Clobazam Clonazepam Diazepam		Amitriptyline Desipramine Nortriptyline
Rheumatology	Celecoxib Flurbiprofen Ibuprofen Meloxicam							

PATIENT INFORMATION
NAME: DEMO PATIENT
DOB: 31/Jan/2024
SEX AT BIRTH: Male

SPECIMEN DETAILS
BARCODE: 50000
SAMPLE ID: 50000
TYPE: SWAB
COLLECTED: 31/Jan/2024

ORDERED BY
DEMO, PHYSICIAN (4U HEALTH)
GENERATED: 11/Mar/2024



Medication Summary

The Medication Summary is a list of medications with evidence for the use of pharmacogenetic information, organized by their therapeutic area. Medications are further organized based on drug-gene interactions. Health care providers should consider the information contained in the Medication Report before making any clinical or therapeutic decisions.

1 Mild or no known interaction
2 Moderate gene-drug interaction
3 Serious gene-drug interaction; should be evaluated carefully and alternative medications should be considered

Analgesia

1
Carisoprodol
Celecoxib
Flurbiprofen
Hydrocodone
Ibuprofen
Meloxicam
Piroxicam
Tenoxicam

2
Alfentanil
Fentanyl
Morphine
Venlafaxine

3
Amitriptyline
Codeine
Desipramine
Imipramine
Nortriptyline
Tramadol

Autoimmune

1
Cyclosporine
Siponimod
Tacrolimus

Cancer

1
Erdafitinib

2
Tamoxifen

Cardiovascular

1
Atorvastatin
Carvedilol
Clopidogrel
Lovastatin
Nebivolol
Pitavastatin
Pravastatin
Propranolol
Rosuvastatin
Simvastatin

2
Flecainide
Fluvastatin
Metoprolol
Propafenone
Warfarin

Gastroenterology

1
Metoclopramide

2
Dexlansoprazole

...Gastroenterology

2
Dronabinol
Lansoprazole
Meclizine
Omeprazole
Pantoprazole

3
Ondansetron

Infection

2
Voriconazole

Mental Health

1
Amoxapine
Amphetamine
Aripiprazole lauroxil
Atomoxetine
Fluvoxamine
Protriptyline
Vortioxetine

2
Alprazolam
Aripiprazole
Asenapine
Brexpiprazole
Bromazepam
Cariprazine
Chlordiazepoxide
Chlorpromazine

...Mental Health

2
Citalopram
Clobazam
Clonazepam
Clorazepate
Clozapine
Diazepam
Escitalopram
Flupentixol
Fluphenazine
Flurazepam
Haloperidol
Iloperidone
Lorazepam
Loxapine
Lurasidone
Methotrimeprazine
Molindone
Nitrazepam
Olanzapine
Oxazepam
Paliperidone
Perphenazine
Pimozide
Prochlorperazine
Promethazine
Quetiapine
Risperidone
Sertraline
Temazepam

...Mental Health

2
Thioridazine
Triazolam
Trifluoperazine
Venlafaxine
Ziprasidone

3
Amitriptyline
Clomipramine
Desipramine
Doxepin
Imipramine
Nortriptyline
Paroxetine
Trimipramine
Zuclopenthixol

Neurology

1
Brivaracetam
Deutetrabenazine
Donepezil
Fosphenytoin
Galantamine
Phenytoin
Propranolol
Tetrabenazine
Valbenazine

2
Clobazam
Clonazepam
Diazepam
Metoprolol
Venlafaxine

3
Amitriptyline
Desipramine

...Neurology

3
Nortriptyline

Rheumatology

1
Celecoxib
Flurbiprofen
Ibuprofen
Meloxicam
Piroxicam
Tenoxicam

Urology

1
Darifenacin
Fesoterodine
Mirabegron
Tamsulosin
Tolterodine

Other

1
Avatrombopag
Cevimeline
Elagolix
Eltrombopag
Flibanserin
Lofexidine
Oral contraceptives

3
Eliglustat

Overview

This pharmacogenetic information is based on best evidence compiled from guidelines and databases including FDA, PharmGKB, Clinical Pharmacogenetics Implementation Consortium (CPIC) and Dutch Pharmacogenetics Working Group (DPWG).

This document includes:
1. Medication Summary: A list of medications organized by their therapeutic area of use and sorted based on their drug-gene interaction severity.
2. Medication Report: Provides information about factors affecting medication response.
3. Guidelines: A table of guidelines used to produce each interpretation.
4. References: Sources of information used to create this report.
5. Laboratory Report: Contains genetic test results in a technical table.

TreatGx and ReviewGx are clinical decision support tools that expand on the contents on this report.

TreatGx

TreatGx is clinical decision support software for precision prescribing that identifies condition-specific medication options based on multiple patient factors.

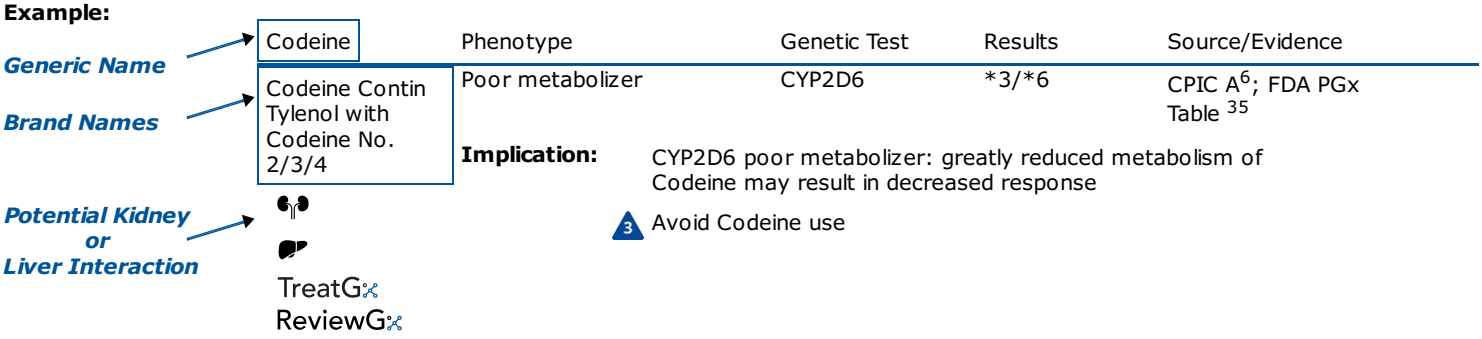
ReviewGx

ReviewGx uses patient factors including pharmacogenetics to highlight medication safety issues, help optimize medications, and identify deprescribing opportunities.

Components of the Medication Report

For all medications, clinical factors, medical conditions, lab values, drug-gene and drug-drug interactions may contribute to medication response and should be evaluated for each patient. The kidney and liver icon notations are intended for informational purposes only. The patient's kidney/liver function are not used for the purposes of displaying this information, and the potential interactions for that specific medication may not apply. TreatGx and ReviewGx help integrate this information to support precision prescribing and comprehensive medication management. The final genotype/phenotype call is at the discretion of the laboratory director. Medication changes should only be initiated at the discretion of the patient's healthcare provider after a full assessment.

Example:



Source/Evidence for Drug-Gene Interactions:

For each medication, a source is listed for each drug-gene interaction. This report prioritizes guidance from CPIC if the drug-gene pair is assigned a CPIC Level of A or B. This is the threshold that CPIC defines as having sufficient evidence for at least one prescribing action to be recommended. See cpicpgx.org/prioritization for a full explanation of CPIC Levels for Genes/Drugs.

Pharmacogenetic information from FDA-approved drug labels or the FDA Table of Pharmacogenetic Associations (https://www.fda.gov/medical-devices/precision-medicine/table-pharmacogenetic-associations) is included when available.

If there is no CPIC guideline (level A or B) or FDA guidance, other sources may be referenced, such as DPWG guidelines, PharmGKB clinical annotations, and in some instances, clinical studies. See https://www.pharmgkb.org/page/clinAnnLevels for a full explanation of PharmGKB levels of evidence. Use of any of this information is at the discretion of the health professional.

* Other clinical factors, medical conditions and drug-drug interactions may contribute to medication response.

Medication Report

The **Medication Report** provides information on how pharmacogenetic results affect each medication.

Use TreatGx and ReviewGx to explore personalized medication treatment options, dosing information and medication optimization.

Alfentanil	Phenotype	Genetic Test	Results	Source/Evidence
Alfenta ReviewGx	Reduced response	OPRM1 rs1799971	G/G	PharmGKB 3
	Implication: OPRM1 alleles indicate a reduced response to Alfentanil			

Alprazolam	Phenotype	Genetic Test	Results	Source/Evidence
Xanax ReviewGx	Intermediate metabolizer	CYP2C9	*1/*2	Case-control studies[13]
	Implication: CYP2C9 alleles indicate increased risk of Alprazolam-related falls			

Amitriptyline	Phenotype	Genetic Test	Results	Source/Evidence
Elavil Levate TreatGx ReviewGx	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	CPIC A[16];FDA PGx Table[35]
	Rapid metabolizer	CYP2C19	*1/*17	CPIC A[16]
	Implication: CYP2D6 ultrarapid metabolizer: increased metabolism of Amitriptyline to less active compounds Lower plasma concentrations of active drug may reduce response CYP2C19 rapid metabolizer: increased metabolism of Amitriptyline may affect response or adverse drug reactions			
	3 Avoid Amitriptyline use (per CPIC optional recommendation). Refer to TreatGx for alternatives and specific dosing recommendations.			

Amoxapine	Phenotype	Genetic Test	Results	Source/Evidence
ReviewGx	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]
	Implication: CYP2D6 alleles do not indicate changes from recommended dose			

Amphetamine	Phenotype	Genetic Test	Results	Source/Evidence
Adzenys TreatGx ReviewGx	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]
	Implication: CYP2D6 alleles do not indicate changes from recommended dose			

Aripiprazole	Phenotype	Genetic Test	Results	Source/Evidence
Abilify Aristada TreatGx ReviewGx	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	DPWG (PharmGKB 1A)[8];FDA PGx Table[35]
	Increased risk of adverse drug reactions	ANKK1/DRD2 rs1800497	G/G	PharmGKB 3
	Implication: ANKK1 alleles indicate an increased risk of tardive dyskinesia CYP2D6 alleles do not indicate changes from recommended dose			

Aripiprazole lauroxil	Phenotype	Genetic Test	Results	Source/Evidence
Aristada ReviewGx	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]
	Implication: CYP2D6 alleles do not indicate changes from recommended dose			

Asenapine	Phenotype	Genetic Test	Results	Source/Evidence
Saphris	Increased risk of adverse drug reactions	ANKK1/DRD2 rs1800497	G/G	PharmGKB 3
TreatG ReviewG	**Implication:** ANKK1 alleles indicate an increased risk of tardive dyskinesia			

Atomoxetine	Phenotype	Genetic Test	Results	Source/Evidence
Strattera	Ultrarapid metabolizer	CYP2D6 (Activity Score)	(*1/*1)3N	CPIC A[4];FDA PGx Table[35]
TreatG ReviewG	**Implication:** CYP2D6 alleles do not indicate changes from recommended dose			

Atorvastatin	Phenotype	Genetic Test	Results	Source/Evidence
Lipitor	Normal function	SLCO1B1	*1/*1	CPIC A[5];FDA PGx Table[35]
TreatG ReviewG	**Implication:** SLCO1B1 alleles indicate typical exposure to Atorvastatin Consider prescribing desired starting dose and adjust based on disease-specific guidelines			

Avatrombopag	Phenotype	Genetic Test	Results	Source/Evidence
Doptelet	Intermediate metabolizer	CYP2C9	*1/*2	FDA PGx Table[35]
ReviewG 	**Implication:** CYP2C9 intermediate metabolizer: results in higher systemic concentrations of Avatrombopag There is a potential impact on pharmacokinetic properties. The impact of CYP2C9 variants on the safety of Avatrombopag has not been established.			

Brexpiprazole	Phenotype	Genetic Test	Results	Source/Evidence
Rexulti	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	DPWG[8];FDA PGx Table[35]
	Increased risk of adverse drug reactions	ANKK1/DRD2 rs1800497	G/G	PharmGKB 3
TreatG ReviewG	**Implication:** ANKK1 alleles indicate an increased risk of tardive dyskinesia CYP2D6 alleles do not indicate changes from recommended dose			

Brivaracetam	Phenotype	Genetic Test	Results	Source/Evidence
Briviact Brivlera	Rapid metabolizer	CYP2C19	*1/*17	FDA PGx Table[35]
ReviewG	**Implication:** CYP2C19 alleles do not indicate changes from recommended dose			

Bromazepam	Phenotype	Genetic Test	Results	Source/Evidence
	Intermediate metabolizer	CYP2C9	*1/*2	Case-control studies[13]
ReviewG 	**Implication:** CYP2C9 alleles indicate increased risk of Bromazepam-related falls			

Cariprazine	Phenotype	Genetic Test	Results	Source/Evidence
Vraylar TreatG ReviewG	Increased risk of adverse drug reactions	ANKK1/DRD2 rs1800497	G/G	PharmGKB 3
	Implication: ANKK1 alleles indicate an increased risk of tardive dyskinesia			

Carisoprodol	Phenotype	Genetic Test	Results	Source/Evidence
ReviewG	Rapid metabolizer	CYP2C19	*1/*17	FDA PGx Table[35]
	Implication: CYP2C19 alleles do not indicate changes from recommended dose			

Carvedilol	Phenotype	Genetic Test	Results	Source/Evidence
Coreg TreatG ReviewG	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]
	Implication: CYP2D6 alleles do not indicate changes from recommended dose			

Celecoxib	Phenotype	Genetic Test	Results	Source/Evidence
Celebrex TreatG ReviewG	Intermediate metabolizer (AS 1.5)	CYP2C9 (Star Alleles)	*1/*2	CPIC A[32];FDA PGx Table[35]
	Implication: CYP2C9 alleles do not indicate changes from recommended dose			

Cevimeline	Phenotype	Genetic Test	Results	Source/Evidence
Evoxac ReviewG	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]
	Implication: CYP2D6 alleles do not indicate changes from recommended dose			

Chlordiazepoxide	Phenotype	Genetic Test	Results	Source/Evidence
Librium ReviewG	Intermediate metabolizer	CYP2C9	*1/*2	Case-control studies[13]
	Implication: CYP2C9 alleles indicate increased risk of Chlordiazepoxide-related falls			

Chlorpromazine	Phenotype	Genetic Test	Results	Source/Evidence
TreatG ReviewG	Increased risk of adverse drug reactions	ANKK1/DRD2 rs1800497	G/G	PharmGKB 3
	Implication: ANKK1 alleles indicate an increased risk of tardive dyskinesia			

Citalopram	Phenotype	Genetic Test	Results	Source/Evidence
Celexa TreatG ReviewG	Rapid metabolizer	CYP2C19	*1/*17	CPIC A[15];FDA PGx Table[35]
	Implication: CYP2C19 rapid metabolizer: increased metabolism of Citalopram to less active compounds			
	Lower plasma concentrations of active drug may reduce response			
	2 Consider an alternative drug not predominantly metabolized by CYP2C19			

Clobazam	Phenotype	Genetic Test	Results	Source/Evidence
Onfi Sympazan	Rapid metabolizer	CYP2C19	*1/*17	FDA PGx Table[35]
	Intermediate metabolizer	CYP2C9	*1/*2	Case-control studies[13]

ReviewGx

Implication: CYP2C9 alleles indicate increased risk of Clobazam-related falls

Clomipramine	Phenotype	Genetic Test	Results	Source/Evidence
Anafranil	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	CPIC B[16];FDA PGx Table[35]
	Rapid metabolizer	CYP2C19	*1/*17	CPIC B[16]

ReviewGx

Implication: CYP2D6 ultrarapid metabolizer: increased metabolism of Clomipramine to less active compounds
Lower plasma concentrations of active drug may reduce response

CYP2C19 rapid metabolizer: increased metabolism of Clomipramine may affect response or adverse drug reactions

3 Avoid Clomipramine use (per CPIC optional recommendation). Refer to TreatGx for alternatives and specific dosing recommendations.

Clonazepam	Phenotype	Genetic Test	Results	Source/Evidence
Klonopin Rivotril	Intermediate metabolizer	CYP2C9	*1/*2	Case-control studies[13]

TreatGx
ReviewGx

Implication: CYP2C9 alleles indicate increased risk of Clonazepam-related falls

Clopidogrel	Phenotype	Genetic Test	Results	Source/Evidence
Plavix	Rapid metabolizer	CYP2C19	*1/*17	CPIC A[20];FDA PGx Table[35]

TreatGx
ReviewGx

Implication: CYP2C19 alleles do not indicate changes from recommended dose

Clorazepate	Phenotype	Genetic Test	Results	Source/Evidence
Gen-Xene Tranxene	Intermediate metabolizer	CYP2C9	*1/*2	Case-control studies[13]

ReviewGx

Implication: CYP2C9 alleles indicate increased risk of Clorazepate-related falls

Clozapine	Phenotype	Genetic Test	Results	Source/Evidence
Clozaril Fazaclo ODT Versacloz	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]
	Increased risk of adverse drug reactions	ANKK1/DRD2 rs1800497	G/G	PharmGKB 3

TreatGx
ReviewGx

Implication: ANKK1 alleles indicate an increased risk of tardive dyskinesia

CYP2D6 alleles do not indicate changes from recommended dose

Codeine	Phenotype	Genetic Test	Results	Source/Evidence
Codeine Contin Tylenol with Codeine No. 2/3/4	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	CPIC A[6];FDA PGx Table[35]

TreatGx
ReviewGx

Implication: CYP2D6 ultrarapid metabolizer: increased metabolism of Codeine to active metabolite may increase the risk of toxicity

3 Avoid Codeine use due to potential for serious toxicity. If opioid use is warranted, consider an opioid other than tramadol or codeine (per CPIC strong recommendation). Refer to TreatGx for alternatives and specific dosing recommendations.

Cyclosporine	Phenotype	Genetic Test	Results	Source/Evidence
Neoral Sandimmune ReviewGx	Poor metabolizer	CYP3A5	*3/*3	PharmGKB 3
	Implication: CYP3A5 alleles do not indicate changes from recommended dose			

Darifenacin	Phenotype	Genetic Test	Results	Source/Evidence
Enablex	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]
TreatGx ReviewGx	**Implication:** CYP2D6 alleles do not indicate changes from recommended dose			

Desipramine	Phenotype	Genetic Test	Results	Source/Evidence
Norpramin TreatGx ReviewGx	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	CPIC B[16];FDA PGx Table[35]
	Implication: CYP2D6 ultrarapid metabolizer: increased metabolism of Desipramine to less active compounds Lower plasma concentrations of active drug may reduce response			
	3 Avoid Desipramine use due to potential lack of efficacy. Consider alternative drug not metabolized by CYP2D6. If use is warranted, consider titrating to a higher target dose (compared to normal metabolizers) – per CPIC optional recommendation. Refer to TreatGx for alternatives and specific dosing recommendations.			

Deutetrabenazine	Phenotype	Genetic Test	Results	Source/Evidence
Austedo	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]
ReviewGx	**Implication:** CYP2D6 alleles do not indicate changes from recommended dose			

Dexlansoprazole	Phenotype	Genetic Test	Results	Source/Evidence
Dexilant	Rapid metabolizer	CYP2C19	*1/*17	CPIC A[22];FDA PGx Table[35]
TreatGx ReviewGx	**Implication:** Optional CPIC recommendation: Initiate standard starting daily dose. Consider increasing dose by 50-100% of the standard dose for the treatment of Helicobacter pylori infection and erosive esophagitis.			

Diazepam	Phenotype	Genetic Test	Results	Source/Evidence
Diastat Valium	Rapid metabolizer	CYP2C19	*1/*17	FDA PGx Table[35]
	Intermediate metabolizer	CYP2C9	*1/*2	Case-control studies[13]
TreatGx ReviewGx	**Implication:** CYP2C9 alleles indicate increased risk of Diazepam-related falls CYP2C19 alleles do not indicate changes from recommended dose			

Donepezil	Phenotype	Genetic Test	Results	Source/Evidence
Aricept	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]
TreatGx ReviewGx	**Implication:** CYP2D6 ultrarapid metabolizer: increased metabolism of Donepezil to less active compounds leads to lower plasma concentrations of active drug There is a potential impact on pharmacokinetic properties. The impact of CYP2D6 variants on the safety of Donepezil has not been established			

Doxepin	Phenotype	Genetic Test	Results	Source/Evidence
Silenor Sinequan	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	CPIC B[16];FDA PGx Table[35]
	Rapid metabolizer	CYP2C19	*1/*17	CPIC B[16]

TreatGx
ReviewGx

Implication: CYP2D6 ultrarapid metabolizer: increased metabolism of Doxepin to less active compounds
Lower plasma concentrations of active drug may reduce response

CYP2C19 rapid metabolizer: increased metabolism of Doxepin may affect response or adverse drug reactions

3 Avoid Doxepin use (per CPIC optional recommendation). Refer to TreatGx for alternatives and specific dosing recommendations.

Dronabinol	Phenotype	Genetic Test	Results	Source/Evidence
Marinol Syndros	Intermediate metabolizer	CYP2C9	*1/*2	FDA PGx Table[35]

ReviewGx

Implication: CYP2C9 intermediate metabolizer: reduced metabolism of Dronabinol to less active compounds

Higher plasma concentrations of active drug may increase the risk of adverse drug reactions

2 This drug has an FDA therapeutic recommendation, refer to drug monograph or FDA labelling for dosing recommendations

Elagolix	Phenotype	Genetic Test	Results	Source/Evidence
Orilissa	Normal function	SLCO1B1	*1/*1	FDA PGx Table[35]

ReviewGx

Implication: SLCO1B1 alleles indicate a typical response to Elagolix

Eliglustat	Phenotype	Genetic Test	Results	Source/Evidence
Cerdelga	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]

ReviewGx

Implication: CYP2D6 ultrarapid metabolizer: increased metabolism of Eliglustat to less active compounds

Lower plasma concentrations of active drug may reduce response

3 Avoid Eliglustat use

2 This drug has an FDA therapeutic recommendation, refer to drug monograph or FDA labelling for dosing recommendations

Eltrombopag	Phenotype	Genetic Test	Results	Source/Evidence
Promacta Revolade	Typical risk of adverse drug reactions	Factor V rs6025	C/C	FDA monograph[28]
	Typical risk of adverse drug reactions	Factor II rs1799963	G/G	PharmGKB 3

ReviewGx

Implication: F2 and F5 alleles do not indicate changes from recommended dose

Erdafitinib	Phenotype	Genetic Test	Results	Source/Evidence
Balversa	Intermediate metabolizer	CYP2C9 (Star Alleles)	*1/*2	FDA PGx Table[35]

ReviewGx

Implication: CYP2C9 alleles do not indicate changes from recommended dose

Escitalopram	Phenotype	Genetic Test	Results	Source/Evidence
Cipralex Lexapro	Rapid metabolizer	CYP2C19	*1/*17	CPIC A[15];FDA PGx Table[35]

TreatGx
ReviewGx

Implication: CYP2C19 rapid metabolizer: increased metabolism of Escitalopram to less active compounds

Lower plasma concentrations of active drug may reduce response

2 Consider an alternative drug not predominantly metabolized by CYP2C19

Fentanyl	Phenotype	Genetic Test	Results	Source/Evidence
Abstral Actiq Duragesic Fentora Lazanda Subsys	Reduced response	OPRM1 rs1799971	G/G	PharmGKB 3

Implication: OPRM1 alleles indicate a reduced response to Fentanyl

ReviewGx

Fesoterodine	Phenotype	Genetic Test	Results	Source/Evidence
Toviaz	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]

Implication: CYP2D6 alleles do not indicate changes from recommended dose

TreatGx
ReviewGx

Flecainide	Phenotype	Genetic Test	Results	Source/Evidence
Tambocor	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	DPWG (PharmGKB 1A)[8]

TreatGx
ReviewGx

Implication: CYP2D6 ultrarapid metabolizer: increased metabolism of Flecainide to less active compounds

Lower plasma concentrations of active drug may reduce response

2 Record electrocardiogram and monitor plasma concentration or select alternative drug

Flibanserin	Phenotype	Genetic Test	Results	Source/Evidence
Addyi	Rapid metabolizer	CYP2C19	*1/*17	FDA PGx Table[35]

Implication: CYP2C19 alleles do not indicate changes from recommended dose

ReviewGx

Flupentixol	Phenotype	Genetic Test	Results	Source/Evidence
Fluanxol	Increased risk of adverse drug reactions	ANKK1/DRD2 rs1800497	G/G	PharmGKB 3

Implication: ANKK1 alleles indicate an increased risk of tardive dyskinesia

TreatGx
ReviewGx

Fluphenazine	Phenotype	Genetic Test	Results	Source/Evidence
Modecate	Increased risk of adverse drug reactions	ANKK1/DRD2 rs1800497	G/G	PharmGKB 3

TreatGx
ReviewGx

Implication: ANKK1 alleles indicate an increased risk of tardive dyskinesia

Flurazepam	Phenotype	Genetic Test	Results	Source/Evidence
	Intermediate metabolizer	CYP2C9	*1/*2	Case-control studies[13]

TreatGx
ReviewGx

Implication: CYP2C9 alleles indicate increased risk of Flurazepam-related falls

Flurbiprofen	Phenotype	Genetic Test	Results	Source/Evidence
Ansaid	Intermediate metabolizer (AS 1.5)	CYP2C9 (Star Alleles)	*1/*2	CPIC A[32];FDA PGx Table[35]

TreatGx
ReviewGx

Implication: CYP2C9 alleles do not indicate changes from recommended dose

Fluvastatin	Phenotype	Genetic Test	Results	Source/Evidence
Lescol	Intermediate metabolizer	CYP2C9	*1/*2	CPIC A[5]
	Normal function	SLCO1B1	*1/*1	CPIC A[5]

TreatGx
ReviewGx

Implication: SLCO1B1 alleles indicate typical exposure to Fluvastatin

CYP2C9 alleles indicate increased Fluvastatin exposure as compared with normal metabolizers

2 For specific CPIC dosing recommendations refer to TreatGx

Fluvoxamine	Phenotype	Genetic Test	Results	Source/Evidence
Luvox	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	CPIC B[15];FDA PGx Table[35]

TreatGx
ReviewGx

Implication: CYP2D6 alleles do not indicate changes from recommended dose

Fosphenytoin	Phenotype	Genetic Test	Results	Source/Evidence
Cerebyx	Intermediate metabolizer	CYP2C9	*1/*2	CPIC A[18]

ReviewGx

Implication: CYP2C9 intermediate metabolizer with an activity score of 1.5: slightly reduced metabolism of Fosphenytoin to less active compounds; however, this does not appear to translate into increased side effects

CYP2C9 alleles do not indicate changes from recommended dose

Galantamine	Phenotype	Genetic Test	Results	Source/Evidence
Razadyne	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]

TreatGx
ReviewGx

Implication: CYP2D6 alleles do not indicate changes from recommended dose

Haloperidol	Phenotype	Genetic Test	Results	Source/Evidence
Haldol	Increased risk of adverse drug reactions	ANKK1/DRD2 rs1800497	G/G	PharmGKB 3

TreatGx
ReviewGx

Implication: ANKK1 alleles indicate an increased risk of tardive dyskinesia

Hydrocodone	Phenotype	Genetic Test	Results	Source/Evidence
Hysingla Zohydro TreatGx ReviewGx	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	CPIC B[6]
	Implication:	CYP2D6 ultrarapid metabolizer: minimal evidence for pharmacokinetic or clinical effect for Hydrocodone No recommendation for Hydrocodone because of minimal evidence regarding adverse events or analgesia (per CPIC "no recommendation").		

Ibuprofen	Phenotype	Genetic Test	Results	Source/Evidence
Advil Caldolor Duexis Motrin IB NeoProfen TreatGx ReviewGx	Intermediate metabolizer (AS 1.5)	CYP2C9 (Star Alleles)	*1/*2	CPIC A[32]
	Implication:	CYP2C9 alleles do not indicate changes from recommended dose		

Iloperidone	Phenotype	Genetic Test	Results	Source/Evidence
Fanapt TreatGx ReviewGx	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]
	Increased risk of adverse drug reactions	ANKK1/DRD2 rs1800497	G/G	PharmGKB 3
	Implication:	ANKK1 alleles indicate an increased risk of tardive dyskinesia CYP2D6 alleles do not indicate changes from recommended dose		

Imipramine	Phenotype	Genetic Test	Results	Source/Evidence
Tofranil TreatGx ReviewGx	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	CPIC B[16];FDA PGx Table[35]
	Rapid metabolizer	CYP2C19	*1/*17	CPIC B[16]
	Implication:	CYP2D6 ultrarapid metabolizer: increased metabolism of Imipramine to less active compounds Lower plasma concentrations of active drug may reduce response CYP2C19 rapid metabolizer: increased metabolism of Imipramine may affect response or adverse drug reactions		
		3 Avoid Imipramine use (per CPIC optional recommendation). Refer to TreatGx for alternatives and specific dosing recommendations.		

Lansoprazole	Phenotype	Genetic Test	Results	Source/Evidence
Prevacid TreatGx ReviewGx	Rapid metabolizer	CYP2C19	*1/*17	CPIC A[22];FDA PGx Table[35]
	Implication:	Moderate CPIC recommendation: Initiate standard starting daily dose. Consider increasing dose by 50-100% of the standard dose for the treatment of Helicobacter pylori infection and erosive esophagitis.		

Lofexidine	Phenotype	Genetic Test	Results	Source/Evidence
Lucemyra TreatGx ReviewGx	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]
	Implication:	CYP2D6 alleles do not indicate changes from recommended dose		

Lorazepam	Phenotype	Genetic Test	Results	Source/Evidence
Ativan	Intermediate metabolizer	CYP2C9	*1/*2	Case-control studies[13]
ReviewGx	**Implication:** CYP2C9 alleles indicate increased risk of Lorazepam-related falls			

Lovastatin	Phenotype	Genetic Test	Results	Source/Evidence
Altoprev	Normal function	SLCO1B1	*1/*1	CPIC A[5]
TreatGx ReviewGx	**Implication:** SLCO1B1 alleles indicate typical exposure to Lovastatin Consider prescribing desired starting dose and adjust based on disease-specific guidelines			

Loxapine	Phenotype	Genetic Test	Results	Source/Evidence
Adasuve Loxapac	Increased risk of adverse drug reactions	ANKK1/DRD2 rs1800497	G/G	PharmGKB 3
TreatGx ReviewGx	**Implication:** ANKK1 alleles indicate an increased risk of tardive dyskinesia			

Lurasidone	Phenotype	Genetic Test	Results	Source/Evidence
Latuda	Increased risk of adverse drug reactions	ANKK1/DRD2 rs1800497	G/G	PharmGKB 3
TreatGx ReviewGx	**Implication:** ANKK1 alleles indicate an increased risk of tardive dyskinesia			

Meclizine	Phenotype	Genetic Test	Results	Source/Evidence
Antivert	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]
ReviewGx	**Implication:** CYP2D6 ultrarapid metabolizer: increased metabolism of Meclizine to less active compounds Lower plasma concentrations of active drug may reduce response 2 This drug has an FDA therapeutic recommendation, refer to drug monograph or FDA labelling for dosing recommendations			

Meloxicam	Phenotype	Genetic Test	Results	Source/Evidence
Anjeso Mobic Qmiiz ODT Vivlodex	Intermediate metabolizer (AS 1.5)	CYP2C9 (Star Alleles)	*1/*2	CPIC A[32]
TreatGx ReviewGx	**Implication:** CYP2C9 alleles do not indicate changes from recommended dose			

Methotrimeprazine	Phenotype	Genetic Test	Results	Source/Evidence
Nozinan	Increased risk of adverse drug reactions	ANKK1/DRD2 rs1800497	G/G	PharmGKB 3
TreatGx ReviewGx	**Implication:** ANKK1 alleles indicate an increased risk of tardive dyskinesia			

Metoclopramide	Phenotype	Genetic Test	Results	Source/Evidence
Metonia Reglan TreatG ReviewG	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]
	Implication: CYP2D6 alleles do not indicate changes from recommended dose			

Metoprolol	Phenotype	Genetic Test	Results	Source/Evidence
Kapspargo Sprinkle Lopressor Toprol-XL TreatG ReviewG	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	DPWG (PharmGKB 1A)[8];FDA PGx Table[35]
	Implication: CYP2D6 ultrarapid metabolizer: increased metabolism of Metoprolol to less active compounds			
	Lower plasma concentrations of active drug may reduce response			
	2 Consider selecting an alternative beta-blocker			

Mirabegron	Phenotype	Genetic Test	Results	Source/Evidence
Myrbetriq TreatG ReviewG	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]
	Implication: CYP2D6 alleles do not indicate changes from recommended dose			

Molindone	Phenotype	Genetic Test	Results	Source/Evidence
Moban TreatG ReviewG	Increased risk of adverse drug reactions	ANKK1/DRD2 rs1800497	G/G	PharmGKB 3
	Implication: ANKK1 alleles indicate an increased risk of tardive dyskinesia			

Morphine	Phenotype	Genetic Test	Results	Source/Evidence
Kadian M-Eslon Morphabond ER MS Contin MS-IR Statex TreatG ReviewG	Reduced response	OPRM1 rs1799971	G/G	PharmGKB 3[6]
	Implication: OPRM1 alleles indicate a reduced response to Morphine			
	The impact of OPRM1 variants on response may not translate to clinically actionable dose alterations			

Nebivolol	Phenotype	Genetic Test	Results	Source/Evidence
Bystolic TreatG ReviewG	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]
	Implication: CYP2D6 alleles do not indicate changes from recommended dose			

Nitrazepam	Phenotype	Genetic Test	Results	Source/Evidence
Mogadon ReviewG	Intermediate metabolizer	CYP2C9	*1/*2	Case-control studies[13]
	Implication: CYP2C9 alleles indicate increased risk of Nitrazepam-related falls			

Nortriptyline	Phenotype	Genetic Test	Results	Source/Evidence
Aventyl Pamelor TreatGx ReviewGx	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	CPIC A[16];FDA PGx Table[35]

Implication: CYP2D6 ultrarapid metabolizer: increased metabolism of Nortriptyline to less active compounds
Lower plasma concentrations of active drug may reduce response

3 Avoid Nortriptyline use due to potential lack of efficacy. Consider alternative drug not metabolized by CYP2D6. If use is warranted, consider titrating to a higher target dose (compared to normal metabolizers) – per CPIC strong recommendation. Refer to TreatGx for alternatives and specific dosing recommendations.

Olanzapine	Phenotype	Genetic Test	Results	Source/Evidence
Zyprexa TreatGx ReviewGx	Increased risk of adverse drug reactions	ANKK1/DRD2 rs1800497	G/G	PharmGKB 3

Implication: ANKK1 alleles indicate an increased risk of tardive dyskinesia

Omeprazole	Phenotype	Genetic Test	Results	Source/Evidence
Losec Olex Prilosec TreatGx ReviewGx	Rapid metabolizer	CYP2C19	*1/*17	CPIC A[22];FDA PGx Table[35]

Implication: Moderate CPIC recommendation: Initiate standard starting daily dose. Consider increasing dose by 50-100% of the standard dose for the treatment of Helicobacter pylori infection and erosive esophagitis.

Ondansetron	Phenotype	Genetic Test	Results	Source/Evidence
Zofran Zuplenz ReviewGx	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	CPIC A[2]

Implication: CYP2D6 ultrarapid metabolizer: increased metabolism of Ondansetron to less active compounds

Lower plasma concentrations of active drug may reduce response

3 Select an alternative drug not predominantly metabolized by CYP2D6

Oral contraceptives	Phenotype	Genetic Test	Results	Source/Evidence
ReviewGx	Typical risk of adverse drug reactions	Factor V rs6025	C/C	PharmGKB 1A
	Typical risk of adverse drug reactions	Factor II rs1799963	G/G	PharmGKB 3

Implication: F2 and F5 alleles do not indicate changes from recommended dose

Oxazepam	Phenotype	Genetic Test	Results	Source/Evidence
ReviewGx	Intermediate metabolizer	CYP2C9	*1/*2	Case-control studies[13]

Implication: CYP2C9 alleles indicate increased risk of Oxazepam-related falls

Paliperidone	Phenotype	Genetic Test	Results	Source/Evidence
Invega TreatGx ReviewGx	Increased risk of adverse drug reactions	ANKK1/DRD2 rs1800497	G/G	PharmGKB 3

Implication: ANKK1 alleles indicate an increased risk of tardive dyskinesia

Pantoprazole	Phenotype	Genetic Test	Results	Source/Evidence
Pantoloc Protonix Tecta TreatG ReviewG	Rapid metabolizer	CYP2C19	*1/*17	CPIC A[22];FDA PGx Table[35]
	Implication:	Moderate CPIC recommendation: Initiate standard starting daily dose. Consider increasing dose by 50-100% of the standard dose for the treatment of Helicobacter pylori infection and erosive esophagitis.		

Paroxetine	Phenotype	Genetic Test	Results	Source/Evidence
Brisdelle Paxil Pexeva TreatG ReviewG	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	CPIC A[15];FDA PGx Table[35]
	Implication:	CYP2D6 ultrarapid metabolizer: increased metabolism of Paroxetine to less active compounds		
		Lower plasma concentrations of active drug may reduce response		
	3	Avoid Paroxetine use		

Perphenazine	Phenotype	Genetic Test	Results	Source/Evidence
TreatG ReviewG	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]
	Increased risk of adverse drug reactions	ANKK1/DRD2 rs1800497	G/G	PharmGKB 3
	Implication:	ANKK1 alleles indicate an increased risk of tardive dyskinesia		
		CYP2D6 alleles do not indicate changes from recommended dose		

Phenytoin	Phenotype	Genetic Test	Results	Source/Evidence
Dilantin Tremytoine Phenytek ReviewG	Intermediate metabolizer	CYP2C9	*1/*2	CPIC A[18]
	Implication:	CYP2C9 intermediate metabolizer with an activity score of 1.5: slightly reduced metabolism of Phenytoin to less active compounds; however, this does not appear to translate into increased side effects		
		CYP2C9 alleles do not indicate changes from recommended dose		

Pimozide	Phenotype	Genetic Test	Results	Source/Evidence
Orap TreatG ReviewG	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]
	Increased risk of adverse drug reactions	ANKK1/DRD2 rs1800497	G/G	PharmGKB 3
	Implication:	ANKK1 alleles indicate an increased risk of tardive dyskinesia		
		CYP2D6 alleles do not indicate changes from recommended dose		

Piroxicam	Phenotype	Genetic Test	Results	Source/Evidence
Feldene TreatG ReviewG	Intermediate metabolizer (AS 1.5)	CYP2C9 (Star Alleles)	*1/*2	CPIC A[32];FDA PGx Table[35]
	Implication:	CYP2C9 alleles do not indicate changes from recommended dose		

Pitavastatin	Phenotype	Genetic Test	Results	Source/Evidence
Livalo Zypitamag TreatG ReviewG	Normal function	SLCO1B1	*1/*1	CPIC A[5]
	Implication:	SLCO1B1 alleles indicate typical exposure to Pitavastatin		
		Consider prescribing desired starting dose and adjust based on disease-specific guidelines		

Pravastatin	Phenotype	Genetic Test	Results	Source/Evidence
Pravachol	Normal function	SLCO1B1	*1/*1	CPIC A[5]

Implication: SLCO1B1 alleles indicate typical exposure to Pravastatin

Consider prescribing desired starting dose and adjust based on disease-specific guidelines

TreatGx
ReviewGx

Prochlorperazine	Phenotype	Genetic Test	Results	Source/Evidence
Compro	Increased risk of adverse drug reactions	ANKK1/DRD2 rs1800497	G/G	PharmGKB 3

TreatGx
ReviewGx

Implication: ANKK1 alleles indicate an increased risk of tardive dyskinesia

Promethazine	Phenotype	Genetic Test	Results	Source/Evidence
Phenadoz Promethegan	Increased risk of adverse drug reactions	ANKK1/DRD2 rs1800497	G/G	PharmGKB 3

TreatGx
ReviewGx

Implication: ANKK1 alleles indicate an increased risk of tardive dyskinesia

Propafenone	Phenotype	Genetic Test	Results	Source/Evidence
Rythmol	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	DPWG (PharmGKB 1A)[8];FDA PGx Table[35]

TreatGx
ReviewGx

Implication: CYP2D6 ultrarapid metabolizer: increased metabolism of Propafenone to less active compounds

Lower plasma concentrations of active drug may reduce response

2 Adjust dose in response to plasma concentration and record electrocardiogram or select an alternative drug

Propranolol	Phenotype	Genetic Test	Results	Source/Evidence
Inderal Innopran	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]

TreatGx
ReviewGx

Implication: CYP2D6 alleles do not indicate changes from recommended dose

Protriptyline	Phenotype	Genetic Test	Results	Source/Evidence
Vivactil	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]

ReviewGx

Implication: CYP2D6 alleles do not indicate changes from recommended dose

Quetiapine	Phenotype	Genetic Test	Results	Source/Evidence
Seroquel	Increased risk of adverse drug reactions	ANKK1/DRD2 rs1800497	G/G	PharmGKB 3

TreatGx
ReviewGx

Implication: ANKK1 alleles indicate an increased risk of tardive dyskinesia

Risperidone	Phenotype	Genetic Test	Results	Source/Evidence
Perseris Risperdal	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	DPWG (PharmGKB 1A)[8]

TreatGx
ReviewGx

Implication: CYP2D6 ultrarapid metabolizer: The percentage of patients with therapy failure increases from 16% to 37%. The gene variation leads to a high ratio of the active metabolite compared to risperidone, which crosses the blood-brain barrier more effectively.

2 Consider titrating the dose or using an alternative drug not predominantly metabolized by CYP2D6

Rosuvastatin	Phenotype	Genetic Test	Results	Source/Evidence
Crestor Ezallor	Normal function	SLCO1B1	*1/*1	CPIC A[5];FDA PGx Table[35]

TreatGx
ReviewGx

Implication: SLCO1B1 alleles indicate typical exposure to Rosuvastatin

Sertraline	Phenotype	Genetic Test	Results	Source/Evidence
Zoloft	Rapid metabolizer	CYP2C19	*1/*17	CPIC B[15]

TreatGx
ReviewGx

Implication: CYP2C19 alleles do not indicate changes from recommended dose

2 If Sertraline is ineffective, consider an alternative drug not predominantly metabolized by CYP2C19

Simvastatin	Phenotype	Genetic Test	Results	Source/Evidence
Zocor Flolipid	Normal function	SLCO1B1	*1/*1	CPIC A[5];FDA PGx Table[35]

TreatGx
ReviewGx

Implication: SLCO1B1 alleles indicate typical exposure to Simvastatin

Consider prescribing desired starting dose and adjust based on disease-specific guidelines

Siponimod	Phenotype	Genetic Test	Results	Source/Evidence
Mayzent	Intermediate metabolizer	CYP2C9 (Star Alleles)	*1/*2	FDA PGx Table[35]

ReviewGx

Implication: CYP2C9 alleles do not indicate changes from recommended dose

Tacrolimus	Phenotype	Genetic Test	Results	Source/Evidence
Advagraf Astagraf XL Envarsus XR Prograf Protopic	Poor metabolizer	CYP3A5	*3/*3	CPIC A[3];FDA PGx Table[35]
	Normal metabolizer	CYP3A4	*1A/*1A	PharmGKB 1B (Pharmacokinetics)/2A (Dosage)

ReviewGx

Implication: CYP3A5 alleles do not indicate changes from recommended dose

CYP3A4 alleles do not indicate changes from recommended dose

Use therapeutic drug monitoring to guide dose adjustments

Tamoxifen	Phenotype	Genetic Test	Results	Source/Evidence
Nolvadex Soltamox	Ultrarapid metabolizer	CYP2D6 (Activity Score)	(*1/*1)3N	CPIC A[11];FDA PGx Table[35]

ReviewGx

Implication: CYP2D6 ultrarapid metabolizer: increased metabolism of Tamoxifen to endoxifen

Strong CPIC recommendation for breast cancer therapy: Initiate therapy with recommended standard of care dosing. Avoid moderate and strong CYP2D6 inhibitors.

2 Recommendation for conditions other than breast cancer: Risk of exaggerated response with pronounced adverse effects (He et al., 2021)

Tamsulosin	Phenotype	Genetic Test	Results	Source/Evidence
Flomax	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]
ReviewGx	**Implication:** CYP2D6 alleles do not indicate changes from recommended dose			

Temazepam	Phenotype	Genetic Test	Results	Source/Evidence
Restoril	Intermediate metabolizer	CYP2C9	*1/*2	Case-control studies[13]
TreatGx ReviewGx	**Implication:** CYP2C9 alleles indicate increased risk of Temazepam-related falls			

Tenoxicam	Phenotype	Genetic Test	Results	Source/Evidence
Mobiflex	Intermediate metabolizer (AS 1.5)	CYP2C9 (Star Alleles)	*1/*2	CPIC A[32]
  ReviewGx	**Implication:** CYP2C9 alleles do not indicate changes from recommended dose			

Tetrabenazine	Phenotype	Genetic Test	Results	Source/Evidence
Austedo Nitoman Xenazine	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]
 ReviewGx	**Implication:** CYP2D6 alleles do not indicate changes from recommended dose			

Thioridazine	Phenotype	Genetic Test	Results	Source/Evidence
TreatGx ReviewGx	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]
	Increased risk of adverse drug reactions	ANKK1/DRD2 rs1800497	G/G	PharmGKB 3
	Implication: ANKK1 alleles indicate an increased risk of tardive dyskinesia CYP2D6 alleles do not indicate changes from recommended dose			

Tolterodine	Phenotype	Genetic Test	Results	Source/Evidence
Detrol	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]
  TreatGx ReviewGx	**Implication:** CYP2D6 alleles do not indicate changes from recommended dose			

Tramadol	Phenotype	Genetic Test	Results	Source/Evidence
Conzip Durela Ralivia Ultram Zytram XL	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	CPIC A[6];FDA PGx Table[35]
  TreatGx ReviewGx	**Implication:** CYP2D6 ultrarapid metabolizer: increased metabolism of Tramadol to active metabolite may increase the risk of toxicity 3 Avoid Tramadol use due to potential for serious toxicity. If opioid use is warranted, consider an opioid other than tramadol or codeine (per CPIC strong recommendation). Refer to TreatGx for alternatives and specific dosing recommendations.			

Triazolam	Phenotype	Genetic Test	Results	Source/Evidence
Halcion	Intermediate metabolizer	CYP2C9	*1/*2	Case-control studies[13]
TreatGx ReviewGx	**Implication:** CYP2C9 alleles indicate increased risk of Triazolam-related falls			

Trifluoperazine	Phenotype	Genetic Test	Results	Source/Evidence
TreatGx ReviewGx	Increased risk of adverse drug reactions	ANKK1/DRD2 rs1800497	G/G	PharmGKB 3
	Implication: ANKK1 alleles indicate an increased risk of tardive dyskinesia			

Trimipramine	Phenotype	Genetic Test	Results	Source/Evidence
Surmontil ReviewGx	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	CPIC B[16];FDA PGx Table[35]
	Rapid metabolizer	CYP2C19	*1/*17	CPIC B[16]
	Implication: CYP2D6 ultrarapid metabolizer: increased metabolism of Trimipramine to less active compounds Lower plasma concentrations of active drug may reduce response CYP2C19 rapid metabolizer: increased metabolism of Trimipramine may affect response or adverse drug reactions 3 Avoid Trimipramine use (per CPIC optional recommendation). Refer to TreatGx for alternatives and specific dosing recommendations.			

Valbenazine	Phenotype	Genetic Test	Results	Source/Evidence
Ingrezza	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]
ReviewGx	**Implication:** CYP2D6 alleles do not indicate changes from recommended dose			

Venlafaxine	Phenotype	Genetic Test	Results	Source/Evidence
Effexor XR	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	DPWG (PharmGKB 1A)[8];FDA PGx Table[35]
TreatGx ReviewGx	**Implication:** CYP2D6 ultrarapid metabolizer: increased metabolism of Venlafaxine to less active compounds Lower plasma concentrations of active drug may reduce response 2 Consider an increase in dose to 150% of the standard dose			

Voriconazole	Phenotype	Genetic Test	Results	Source/Evidence
Vfend	Rapid metabolizer	CYP2C19	*1/*17	CPIC A[26];FDA PGx Table[35]
ReviewGx	**Implication:** CYP2C19 rapid metabolizer: increased metabolism of Voriconazole to less active compounds Lower plasma concentrations of active drug may reduce response 2 Consider an alternative drug not predominantly metabolized by CYP2C19			

Vortioxetine	Phenotype	Genetic Test	Results	Source/Evidence
Trintellix	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	FDA PGx Table[35]
TreatGx ReviewGx	**Implication:** CYP2D6 alleles do not indicate changes from recommended dose			

Warfarin	Phenotype	Genetic Test	Results	Source/Evidence
Coumadin Jantoven	Intermediate metabolizer	CYP2C9	*1/*2	CPIC A[17];FDA PGx Table[35]
TreatGx ReviewGx	Increased response	VKORC1	A/A	CPIC A[17];FDA PGx Table[35]
	Implication: 2 The algorithm in TreatGx includes pharmacogenetics and other clinical factors in calculating initial warfarin dose			

Ziprasidone	Phenotype	Genetic Test	Results	Source/Evidence
Geodon Zeldox TreatG ReviewG	Increased risk of adverse drug reactions	ANKK1/DRD2 rs1800497	G/G	PharmGKB 3
	Implication:	ANKK1 alleles indicate an increased risk of tardive dyskinesia		

Zuclopenthixol	Phenotype	Genetic Test	Results	Source/Evidence
Clopixol TreatG ReviewG	Ultrarapid metabolizer	CYP2D6	(*1/*1)3N	DPWG (PharmGKB 1A)[8]
	Increased risk of adverse drug reactions	ANKK1/DRD2 rs1800497	G/G	PharmGKB 3
	Implication:	CYP2D6 ultrarapid metabolizer: increased metabolism of Zuclopenthixol to less active compounds		
		Lower plasma concentrations of active drug may reduce response		
		Avoid Zuclopenthixol use		
		ANKK1 alleles indicate an increased risk of tardive dyskinesia		

Table of Available References

Drug	Genetic Test	Sources
Alfentanil	OPRM1 rs1799971	PharmGKB
Alprazolam	CYP2C9	Case-control studies[13]
Amitriptyline	CYP2D6	CPIC[16];FDA[35]
Amitriptyline	CYP2C19	CPIC[16]
Amoxapine	CYP2D6	FDA[35]
Amphetamine	CYP2D6	FDA[35]
Aripiprazole	CYP2D6	DPWG[8];FDA[35]
Aripiprazole	ANKK1/DRD2 rs1800497	PharmGKB
Aripiprazole lauroxil	CYP2D6	FDA[35]
Asenapine	ANKK1/DRD2 rs1800497	PharmGKB
Atomoxetine	CYP2D6 (Activity Score)	CPIC[4];FDA[35]
Atorvastatin	SLCO1B1	CPIC[5];FDA[35]
Avatrombopag	CYP2C9	FDA[35]
Brexpiprazole	CYP2D6	DPWG[8];FDA[35]
Brexpiprazole	ANKK1/DRD2 rs1800497	PharmGKB
Brivaracetam	CYP2C19	FDA[35]
Bromazepam	CYP2C9	Case-control studies[13]
Cariprazine	ANKK1/DRD2 rs1800497	PharmGKB
Carisoprodol	CYP2C19	FDA[35]
Carvedilol	CYP2D6	FDA[35]
Celecoxib	CYP2C9 (Star Alleles)	CPIC[32];FDA[35]
Cevimeline	CYP2D6	FDA[35]
Chlordiazepoxide	CYP2C9	Case-control studies[13]
Chlorpromazine	ANKK1/DRD2 rs1800497	PharmGKB
Citalopram	CYP2C19	CPIC[15];FDA[35]

Drug	Genetic Test	Sources
Clobazam	CYP2C19	FDA[35]
Clobazam	CYP2C9	Case-control studies[13]
Clomipramine	CYP2D6	CPIC[16];FDA[35]
Clomipramine	CYP2C19	CPIC[16]
Clonazepam	CYP2C9	Case-control studies[13]
Clopidogrel	CYP2C19	CPIC[20];FDA[35]
Clorazepate	CYP2C9	Case-control studies[13]
Clozapine	CYP2D6	FDA[35]
Clozapine	ANKK1/DRD2 rs1800497	PharmGKB
Codeine	CYP2D6	CPIC[6];FDA[35]
Cyclosporine	CYP3A5	PharmGKB
Darifenacin	CYP2D6	FDA[35]
Desipramine	CYP2D6	CPIC[16];FDA[35]
Deutetrabenazine	CYP2D6	FDA[35]
Dexlansoprazole	CYP2C19	CPIC[22];FDA[35]
Diazepam	CYP2C19	FDA[35]
Diazepam	CYP2C9	Case-control studies[13]
Donepezil	CYP2D6	FDA[35]
Doxepin	CYP2D6	CPIC[16];FDA[35]
Doxepin	CYP2C19	CPIC[16]
Dronabinol	CYP2C9	FDA[35]
Elagolix	SLCO1B1	FDA[35]
Eliglustat	CYP2D6	DPWG[8];FDA[35]
Eltrombopag	Factor V rs6025	FDA[28]
Eltrombopag	Factor II rs1799963	PharmGKB

Drug	Genetic Test	Sources
Erdafitinib	CYP2C9 (Star Alleles)	FDA[35]
Escitalopram	CYP2C19	CPIC[15];FDA[35]
Fentanyl	OPRM1 rs1799971	PharmGKB
Fesoterodine	CYP2D6	FDA[35]
Flecainide	CYP2D6	DPWG[8]
Flibanserin	CYP2C19	FDA[35]
Flupentixol	ANKK1/DRD2 rs1800497	PharmGKB
Fluphenazine	ANKK1/DRD2 rs1800497	PharmGKB
Flurazepam	CYP2C9	Case-control studies[13]
Flurbiprofen	CYP2C9 (Star Alleles)	CPIC[32];FDA[35]
Fluvastatin	CYP2C9	CPIC[5]
Fluvastatin	SLCO1B1	CPIC[5]
Fluvoxamine	CYP2D6	CPIC[15];FDA[35]
Fosphenytoin	CYP2C9	CPIC[18]
Galantamine	CYP2D6	FDA[35]
Haloperidol	ANKK1/DRD2 rs1800497	PharmGKB
Hydrocodone	CYP2D6	CPIC[6]
Ibuprofen	CYP2C9 (Star Alleles)	CPIC[32]
Iloperidone	CYP2D6	FDA[35]
Iloperidone	ANKK1/DRD2 rs1800497	PharmGKB
Imipramine	CYP2D6	CPIC[16];FDA[35]
Imipramine	CYP2C19	CPIC[16]
Lansoprazole	CYP2C19	CPIC[22];FDA[35]
Lofexidine	CYP2D6	FDA[35]
Lorazepam	CYP2C9	Case-control studies[13]

Drug	Genetic Test	Sources
Lovastatin	SLCO1B1	CPIC[5]
Loxapine	ANKK1/DRD2 rs1800497	PharmGKB
Lurasidone	ANKK1/DRD2 rs1800497	PharmGKB
Meclizine	CYP2D6	FDA[35]
Meloxicam	CYP2C9 (Star Alleles)	CPIC[32]
Methotrimeprazine	ANKK1/DRD2 rs1800497	PharmGKB
Metoclopramide	CYP2D6	FDA[35]
Metoprolol	CYP2D6	DPWG[8];FDA[35]
Mirabegron	CYP2D6	FDA[35]
Molindone	ANKK1/DRD2 rs1800497	PharmGKB
Morphine	OPRM1 rs1799971	PharmGKB[6]
Nebivolol	CYP2D6	FDA[35]
Nitrazepam	CYP2C9	Case-control studies[13]
Nortriptyline	CYP2D6	CPIC[16];FDA[35]
Olanzapine	ANKK1/DRD2 rs1800497	PharmGKB
Omeprazole	CYP2C19	CPIC[22];FDA[35]
Ondansetron	CYP2D6	CPIC[2]
Oral contraceptives	Factor V rs6025	PharmGKB
Oral contraceptives	Factor II rs1799963	PharmGKB
Oxazepam	CYP2C9	Case-control studies[13]
Paliperidone	ANKK1/DRD2 rs1800497	PharmGKB
Pantoprazole	CYP2C19	CPIC[22];FDA[35]
Paroxetine	CYP2D6	CPIC[15];FDA[35]
Perphenazine	CYP2D6	FDA[35]
Perphenazine	ANKK1/DRD2 rs1800497	PharmGKB

Drug	Genetic Test	Sources
Phenytoin	CYP2C9	CPIC[18]
Pimozide	CYP2D6	DPWG[8];FDA[35]
Pimozide	ANKK1/DRD2 rs1800497	PharmGKB
Piroxicam	CYP2C9 (Star Alleles)	CPIC[32];FDA[35]
Pitavastatin	SLCO1B1	CPIC[5]
Pravastatin	SLCO1B1	CPIC[5]
Prochlorperazine	ANKK1/DRD2 rs1800497	PharmGKB
Promethazine	ANKK1/DRD2 rs1800497	PharmGKB
Propafenone	CYP2D6	DPWG[8];FDA[35]
Propranolol	CYP2D6	FDA[35]
Protriptyline	CYP2D6	FDA[35]
Quetiapine	ANKK1/DRD2 rs1800497	PharmGKB
Risperidone	CYP2D6	DPWG[8]
Rosuvastatin	SLCO1B1	CPIC[5];FDA[35]
Sertraline	CYP2C19	CPIC[15]
Simvastatin	SLCO1B1	CPIC[5];FDA[35]
Siponimod	CYP2C9 (Star Alleles)	FDA[35]
Tacrolimus	CYP3A5	CPIC[3];FDA[35]
Tacrolimus	CYP3A4	PharmGKB
Tamoxifen	CYP2D6 (Activity Score)	Clinical trial[14];CPIC[11];FDA[35]
Tamsulosin	CYP2D6	FDA[35]
Temazepam	CYP2C9	Case-control studies[13]
Tenoxicam	CYP2C9 (Star Alleles)	CPIC[32]
Tetrabenazine	CYP2D6	FDA[35]
Thioridazine	CYP2D6	FDA[35]

Drug	Genetic Test	Sources
Thioridazine	ANKK1/DRD2 rs1800497	PharmGKB
Tolterodine	CYP2D6	FDA[35]
Tramadol	CYP2D6	CPIC[6];FDA[35]
Triazolam	CYP2C9	Case-control studies[13]
Trifluoperazine	ANKK1/DRD2 rs1800497	PharmGKB
Trimipramine	CYP2D6	CPIC[16];FDA[35]
Trimipramine	CYP2C19	CPIC[16]
Valbenazine	CYP2D6	FDA[35]
Venlafaxine	CYP2D6	DPWG[8];FDA[35]
Voriconazole	CYP2C19	CPIC[26];FDA[35]
Vortioxetine	CYP2D6	FDA[35]
Warfarin	CYP2C9	CPIC[17];FDA[35]
Warfarin	VKORC1	CPIC[17];FDA[35]
Ziprasidone	ANKK1/DRD2 rs1800497	PharmGKB
Zuclopenthixol	CYP2D6	DPWG[8]
Zuclopenthixol	ANKK1/DRD2 rs1800497	PharmGKB

References

1: Amstutz, U. et al. Clinical Pharmacogenetics Implementation Consortium (CPIC) Guideline for Dihydropyrimidine Dehydrogenase Genotype and Fluoropyrimidine Dosing: 2017 Update. Clinical Pharmacology & Therapeutics 103, 210-216 (2017).

2: Bell, G. et al. Clinical Pharmacogenetics Implementation Consortium (CPIC) guideline for CYP2D6 genotype and use of ondansetron and tropisetron. Clinical Pharmacology & Therapeutics 102, 213-218 (2017).

3: Birdwell, K. et al. Clinical Pharmacogenetics Implementation Consortium (CPIC) Guidelines for CYP3A5 Genotype and Tacrolimus Dosing. Clinical Pharmacology & Therapeutics 98, 19-24 (2015).

4: Brown, J. et al. Clinical Pharmacogenetics Implementation Consortium Guideline for Cytochrome P450 (CYP)2D6 Genotype and Atomoxetine Therapy. Clinical Pharmacology & Therapeutics 106, 94-102 (2019).

5: CooperDeHoff, RM. et al. Clinical Pharmacogenetics Implementation Consortium Guideline for SLCO1B1, ABCG2, and CYP2C9 genotypes and StatinAssociated Musculoskeletal Symptoms. Clinical Pharmacology & Therapeutics 111, 10071021 (2022).

6: Crews, K. et al. Clinical Pharmacogenetics Implementation Consortium (CPIC) Guideline for CYP2D6, OPRM1, and COMT genotype and select opioid therapy. Clinical Pharmacology & Therapeutics 110, 888-896 (2021).

7: Desta, Z. et al. Clinical Pharmacogenetics Implementation Consortium (CPIC) Guideline for CYP2B6 and Efavirenz-Containing Antiretroviral Therapy. Clinical Pharmacology & Therapeutics 106, 726-733 (2019).

8: Dutch Pharmacogenetics Working Group. Dutch Pharmacogenetics Working Group Guidelines May 2020. (2020).

9: Gammal RS. et al. Clinical Pharmacogenetics Implementation Consortium Guideline for Medication Use in the Context of G6PD Genotype. Clinical Pharmacology & Therapeutics 113, 973-985 (2022).

10: Gammal, RS. et al. Clinical Pharmacogenetics Implementation Consortium (CPIC) Guideline for UGT1A1 and Atazanavir Prescribing. Clinical Pharmacology & Therapeutics 99, 363-369 (2016).

11: Goetz M. et al. Clinical Pharmacogenetics Implementation Consortium (CPIC) Guideline for CYP2D6 and Tamoxifen Therapy. Clinical Pharmacology & Therapeutics 103, 770-777 (2018).

12: Gonsalves, SG. et al. Clinical Pharmacogenetics Implementation Consortium (CPIC) Guideline for the Use of Potent Volatile Anesthetic Agents and Succinylcholine in the Context of RYR1 or CACNA1S Genotypes. Clinical Pharmacology & Therapeutics 105, 1338-1344 (2019).

13: Ham, A. et al. CYP2C9 Genotypes Modify Benzodiazepine-Related Fall Risk: Original Results From Three Studies With Meta-Analysis. Journal of the American Medical Directors Association 18, 88.e1-88.e15 (2017).

14: He, W. et al. CYP2D6 genotype predicts tamoxifen discontinuation and drug response: a secondary analysis of the KARISMA trial. Annals of Oncology 32, 1286-1293 (2021).

15: Hicks, J. et al. Clinical Pharmacogenetics Implementation Consortium (CPIC) Guideline for CYP2D6 and CYP2C19 Genotypes and Dosing of Selective Serotonin Reuptake Inhibitors. Clinical Pharmacology & Therapeutics 98, 127-134 (2015).

16: Hicks, J. et al. Clinical pharmacogenetics implementation consortium guideline (CPIC) for CYP2D6 and CYP2C19 genotypes and dosing of tricyclic antidepressants: 2016 update. Clinical Pharmacology & Therapeutics 102, 37-44 (2017).

17: Johnson, J. et al. Clinical Pharmacogenetics Implementation Consortium (CPIC) Guideline for Pharmacogenetics-Guided Warfarin Dosing: 2017 Update. Clinical Pharmacology & Therapeutics 102, 397-404 (2017).

18: Karnes, J. et al. Clinical pharmacogenetics implementation consortium (CPIC) guideline for CYP2C9 and HLA-B genotypes and phenytoin dosing: 2020 update. Clinical Pharmacology & Therapeutics 109, 302-309 (2021).

19: King, D. et al. Smoking cessation pharmacogenetics: analysis of varenicline and bupropion in placebo-controlled clinical trials. Neuropsychopharmacology 37, 641-650 (2012).

20: Lee, C. et al. Clinical Pharmacogenetics Implementation Consortium Guideline for CYP2C19 Genotype and Clopidogrel Therapy: 2022 Update. Clinical Pharmacology & Therapeutics 112, 959-967 (2022).

21: Lerman, C. et al. Use of the nicotine metabolite ratio as a genetically informed biomarker of response to nicotine patch or varenicline for smoking cessation: a randomised, double-blind placebo-controlled trial. The Lancet Respiratory Medicine 3, 131-138 (2015).

22: Lima, J. et al. Clinical Pharmacogenetics Implementation Consortium (CPIC) Guideline for CYP2C19 and Proton Pump Inhibitor Dosing. Clinical Pharmacology & Therapeutics (2020)

23: Lipworth, J. et al. Tailored second-line therapy in asthmatic children with the Arg(16) genotype. Clinical science 124, 521-528 (2013).

24: Martin, MA. et al. Clinical pharmacogenetics implementation consortium guidelines for HLA-B genotype and abacavir dosing. Clinical Pharmacology & Therapeutics 91, 734-738 (2012).

25: McDermott, JH. et al. Clinical Pharmacogenetics Implementation Consortium Guideline for the Use of Aminoglycosides Based on MT-RNR1 Genotype. Clinical Pharmacology & Therapeutics 111, 366-372 (2022).

26: Moriyama, B. et al. Clinical Pharmacogenetics Implementation Consortium (CPIC) Guidelines for CYP2C19 and Voriconazole Therapy. Clinical Pharmacology & Therapeutics 102, 45-51 (2017).

27: Muir, A. et al. Clinical Pharmacogenetics Implementation Consortium (CPIC) Guidelines for IFNL3 (IL28B) Genotype and PEG Interferon-alpha-Based Regimens. Clinical Pharmacology & Therapeutics 95, 141-146 (2014).

28: Novartis Pharmaceuticals Corporation. Promacta Product Monograph. 10 (2018).

29: Phillips, E. et al. Clinical Pharmacogenetics Implementation Consortium Guideline for HLA Genotype and Use of Carbamazepine and Oxcarbazepine: 2017 Update. Clinical Pharmacology & Therapeutics 103, 574-581 (2018).

30: Relling, M. et al. Clinical Pharmacogenetics Implementation Consortium Guideline for Thiopurine Dosing Based on TPMT and NUDT15 Genotypes: 2018 Update. Clinical Pharmacology & Therapeutics 105, 1095-1105 (2019).

31: Saito, Y. et al. Clinical Pharmacogenetics Implementation Consortium (CPIC) guidelines for human leukocyte antigen B (HLA-B) genotype and allopurinol dosing: 2015 update. Clinical Pharmacology & Therapeutics 99, 36-37 (2015).

32: Theken, K. et al. Clinical Pharmacogenetics Implementation Consortium (CPIC) Guideline for CYP2C9 and Nonsteroidal Anti-inflammatory Drugs. Clinical Pharmacology & Therapeutics 108, 191-200 (2020)

33: Ueta, M. et al. Independent strong association of HLAA*02:06 and HLAB*44:03 with cold medicinerelated StevensJohnson syndrome with severe mucosal involvement. Scientific Reports 4, 4862 (2014).

34: Ueta, M. et al. Transethnic study confirmed independent associations of HLAA*02:06 and HLAB*44:03 with cold medicinerelated Stevens-Johnson syndrome with severe ocular surface complications. Scientific Reports 4, 5981 (2014).

35: US Food and Drug Administration. Table of Pharmacogenetic Associations. (2022).

36: Vijverberg, S. et al. Arg16 ADRB2 genotype increases the risk of exacerbations in children with a reported use of beta-2 agonists: Results of the PACMAN cohort study. Pharmaceutisch Weekblad 150, 233-238 (2015).

37: Wakamatsu, T. et al. Human Leukocyte Antigen Class I Genes Associated With Stevens-Johnson Syndrome and Severe Ocular Complications Following Use of Cold Medicine in a Brazilian Population. JAMA Ophthalmology 135, 355 (2017).

38: Wechsler, M. et al. Effect of beta2-adrenergic receptor polymorphism on response to longacting beta-agonist in asthma (LARGE trial): a genotype-stratified, randomised, placebo-controlled, crossover trial. The Lancet 374, 1754-1764 (2009).

Methods

The results meet stringent quality control metrics for DNA isolation and genotyping. Array based assays detect listed alleles, including all common and most rare variants with known clinical significance at analytical sensitivity and specificity >99%.

Reference Lab Details:
Name: Vision Laboratories
Lab Director: Lekh Sharma, Ph.D., MT (AAB), TC (NRCC)
CLIA: 44D2080585
Reference Lab Address: 6130 Shallowford Road #100, Chattanooga TN 37421
Phone: 1.844.484.3522
Website: http://www.visionlaboratories.com

Limitations

This test will not detect all the known mutations that result in altered or inactive tested genes. Absence of a detectable gene mutation or polymorphism does not rule out the possibility that a patient has intermediate or high sensitivity phenotypes due to the presence of an undetected polymorphism or due to drug-drug interactions. There may be other genetic factors impacting individual patient dosing that are not included in this test. The annotations and interpretations provided in this report are based on scientific literature and do not take into account drug-drug interactions, medical conditions or other clinical factors that may affect medication response. Gene-drug interactions are ranked according to guidelines, level of evidence and clinical utility. GenXys reports and TreatGx Clinical Decision Support are regularly updated. The current predicted phenotype and allele functionality may change in the future depending on new evidence. Phenotype annotations for CYP2C9 are based on total activity scores as defined by CPIC[79]. Genetic test results and interpretation may be inaccurate for individuals who have undergone or are receiving non-autologous blood transfusion, tissue, or organ transplant therapies.

The report includes alleles of proteins involved in the metabolism of many medications. In rare cases, a variant that is not covered may be typed as *1 or other variants. In the case of pseudogenes and mutations in the untranslated regions of genes, incorrect allele typing may occur despite proper SNP detection. Preferential amplification of one allele over another present in the sample may also lead to incorrect genotyping.

Liability Disclaimer

This test was developed, and its performance characteristics determined by Vision Laboratories. It has not been cleared or approved by the US Food and Drug Administration. The report is not a diagnostic test, and TreatGx is not a prescribing system. You should discuss your pharmacogenetic information with a physician or other health care provider before you act upon the pharmacogenetic information resulting from this report. The medication brand names are not an exhaustive list and do not include combination therapies. Not all medications in this report are included in the TreatGx or ReviewGx software or other GenXys derivative works.

Vision Lab Director

Lekh Sharma, PhD, TC (NRCC), Vision Lab Director, CLIA: 44D2080585,
CAP: 9006075-01

11/Mar/2024

Date of Signature

PATIENT INFORMATION
NAME: DEMO PATIENT
DOB: 31/Jan/2024
SEX AT BIRTH: Male

SPECIMEN DETAILS
BARCODE: 50000
SAMPLE ID: 50000
TYPE: SWAB
COLLECTED: 31/Jan/2024

ORDERED BY
DEMO, PHYSICIAN (4U HEALTH)
GENERATED: 11/Mar/2024

Laboratory Report

The **Laboratory Report** contains your genetic results.

Gene	rsID	HGVS	HGVS Reference	Result
APOE	rs429358	c.388T>C	NC_000019.10	C/T
APOE	rs7412	c.526C>T	NC_000019.10	C/C
COMT	rs4680	c.472G>A	NC_000022.11	A/A
CYP1A2	rs12720461	c.-10+113C>T	NC_000015.10	C/C
CYP1A2	rs2069514	g.74745879G>A	NC_000015.10	G/G
CYP1A2	rs35694136	c.-1635T>-	NC_000015.10	T/T
CYP1A2	rs762551	c.-9-154A>C	NC_000015.10	A/A
CYP2B6	rs3745274	c.516G>A/T	NM_000767.5	G/G
CYP2C19	rs12248560	c.-806C>T	NM_000769.2	C/T
CYP2C19	rs28399504	c.1A>G	NM_000769.1	A/A
CYP2C19	rs41291556	c.358T>C	NM_000769.1	T/T
CYP2C19	rs4244285	c.681G>A	NM_000769.1	G/G
CYP2C19	rs4986893	c.636G>A	NM_000769.1	G/G
CYP2C19	rs72552267	c.395G>A	NM_000769.1	G/G
CYP2C19	rs17884712	c.431G>A	NM_000769.1	G/G
CYP2C19	rs6413438	c.680C>T	NM_000769.1	C/C
CYP2C19	rs72558186	g.19294T>A	NM_000769.1	T/T
CYP2C9	rs1057910	c.1075A>C	NM_000771.3	A/A
CYP2C9	rs1799853	c.430C>T	NM_000771.3	C/T
CYP2C9	rs28371685	c.1003C>T	NM_000771.3	C/C
CYP2C9	rs28371686	c.1080C>G	NM_000771.3	C/C
CYP2C9	rs9332131	c.817delA	NM_000771.3	A/A
CYP2C9	rs56165452	c.1076T>C	NM_000771.3	T/T
CYP2C9	rs7900194	c.449G>A/C/T	NM_000771.4	G/G
CYP2D6	rs1065852	c.100C>T	NM_000106.5	G/G
CYP2D6	rs16947	c.886C>T	NM_000106.5	G/G
CYP2D6	rs28371706	c.320C>A	NM_000106.5	G/G
CYP2D6	rs28371725	c.985+39G>A	NM_000106.5	C/C
CYP2D6	rs35742686	c.775delA	NM_000106.5	T/T
CYP2D6	rs3892097	c.506-1G>A	NM_000106.5	C/C
CYP2D6	rs5030655	c.454delT	NM_000106.5	A/A
CYP2D6	rs5030656	c.841_843delAAG	NM_000106.5	CTT/CTT
CYP2D6	rs5030867	c.971A>C	NM_000106.5	T/T
CYP2D6	rs59421388	c.1012G>A	NM_000106.5	C/C
CYP2D6	rs5030862	g.124G>A	NM_000106.5	C/C

Gene	rsID	HGVS	HGVS Reference	Result
CYP2D6	rs5030865	g.1758G>T,G>A	NM_000106.5	C/C
CYP2D6	rs769258	c.31G>A	NM_000106.6	C/C
CYP2D6	rs1080985	c.-1584C>G	NC_000022.11	G/G
CYP3A4	rs2740574	c.-392T>C	NC_000007.14	T/T
CYP3A4	rs35599367	c.522-191G>A	NC_000007.14	G/G
CYP3A5	rs10264272	c.624G>A	NM_000777.4	C/C
CYP3A5	rs41303343	c.1035_1036insT	NM_000777.4	A/A (-/-)[1]
CYP3A5	rs776746	c.219-237G>A	NM_000777.4	C/C
CYP3A5	rs28365083	g.27289C>A	NM_000777.4	G/G
DRD2;ANKK1	rs1800497	c.2137G>A	NM_178510.2	G/G
Factor II	rs1799963	c.*97G>A	NM_000506.4	G/G
Factor V	rs6025	c.1601G>A	NM_000130.4	C/C
ITGB3	rs5918	c.176T>C	NM_000212.3	T/T
LPA	rs3798220	c.5673A>G	NM_005577.4	T/T
LPA	rs10455872	c.3947+467T>C	NM_005577.4	A/G
MTHFR	rs1801131	c.1409T>G	NC_000001.11	T/T
MTHFR	rs1801133	c.788G>A	NC_000001.11	G/A
OPRM1	rs1799971	c.118A>G	NM_000914.5	G/G
SLCO1B1	rs4149056	c.521T>C	NM_006446.4	T/T
TPMT	rs1142345	c.719A>G/C	NM_000367.3	T/T
TPMT	rs1800460	c.460G>A	NM_000367.3	C/C
TPMT	rs1800462	c.238G>C	NM_000367.3	C/C
VKORC1	rs9923231	c.-1639G>T	NM_001311311.1	A/A (T/T)[1]

1: Pharmacogenetic testing may occasionally lead to unusual genotypes. In these situations pharmacogenetic laboratories will sometimes report on alternative genotypes. If this is done then both genotypes appear in the result table; a genotype in () is the alternative genotype chosen by the lab.

Copy Number Variation

Gene	Reference	Result
CYP2D6	NG_008376.3 exon 9	3

Phenotype Table

Gene	Allele Result	Phenotype Result
CYP2D6	(*1/*1)3N	Ultrarapid Metabolizer
CYP2C9	*1/*2	Intermediate Metabolizer
CYP2C19	*1/*17	Rapid Metabolizer
CYP3A4	*1A/*1A	Normal Metabolizer
CYP3A5	*3/*3	Poor Metabolizer
SLCO1B1	*1/*1	Normal Function
TPMT	*1/*1	Normal Metabolizer