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

Medication Summary

The Medication Summary lists medications with pharmacogenetic associations, organized by therapeutic area and drug-gene interaction severity. The highest severity is prioritized (moderate/severe) from all relevant sources and genes for a medication. See Medication Report for full details.

1 Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

2 Moderate drug-gene interaction

3 Serious drug-gene interaction: avoid/select alternative

Analgesia

1
- Carisoprodol
- Celecoxib
- Codeine
- Desipramine
- Flurbiprofen
- Hydrocodone
- Ibuprofen
- Lamotrigine
- Meloxicam
- Methadone
- Nortriptyline
- Oliceridine
- Oxcarbazepine
- Oxycodone
- Piroxicam
- Tenoxicam
- Tramadol
- Venlafaxine

2
- Amitriptyline
- Imipramine

3
- Carbamazepine

Autoimmune

1
- Azathioprine
- Mercaptopurine
- Siponimod
- Thioguanine

2
- Cyclosporine
- Tacrolimus

Cancer

1
- Capecitabine
- Erdafitinib
- Fluorouracil
- Gefitinib
- Irinotecan
- Mercaptopurine
- Pazopanib
- Tamoxifen
- Thioguanine

Cardiovascular

1
- Carvedilol
- Clopidogrel
- Flecainide
- Mavacamten
- Metoprolol
- Nebivolol

...Cardiovascular

1
- Propafenone
- Propranolol

2
- Atorvastatin
- Fluvastatin
- Pitavastatin
- Pravastatin
- Rosuvastatin
- Warfarin

3
- Lovastatin
- Simvastatin

Endocrinology

1
- Nateglinide

Gastroenterology

1
- Dronabinol
- Esomeprazole
- Meclizine
- Metoclopramide
- Ondansetron
- Rabeprazole

2
- Dexlansoprazole
- Lansoprazole

...Gastroenterology

2
- Omeprazole
- Pantoprazole

Infection

1
- Abacavir
- Atazanavir
- Efavirenz
- Nevirapine

3
- Voriconazole

Mental Health

1
- Amoxapine
- Amphetamine
- Aripiprazole
- Aripiprazole lauroxil
- Brexpiprazole
- Clozapine
- Desipramine
- Dextromethorphan/ Bupropion
- Diazepam
- Fluoxetine
- Fluvoxamine
- Haloperidol
- Iloperidone
- Lamotrigine
- Lofexidine

...Mental Health

1

Methadone
Mirtazapine
Nortriptyline
Oxcarbazepine
Paroxetine
Perphenazine
Pimozide
Protriptyline
Quetiapine
Risperidone
Sertraline
Thioridazine
Venlafaxine
Viloxazine
Vortioxetine
Zuclopenthixol

2

Amitriptyline
Atomoxetine
Citalopram
Clomipramine
Doxepin
Escitalopram
Imipramine
Trimipramine

3

Carbamazepine

Neurology

1

Brivaracetam
Clobazam
Deutetrabenazine
Dextromethorphan/ Quinidine
Diazepam

...Neurology

1

Donepezil
Fosphenytoin
Galantamine
Lamotrigine
Metoprolol
Oxcarbazepine
Phenytoin
Pitolisant
Propranolol
Tetrabenazine
Valbenazine
Venlafaxine

2

Amitriptyline

3

Carbamazepine

Rheumatology

1

Allopurinol
Azathioprine
Celecoxib
Flurbiprofen
Ibuprofen
Meloxicam
Piroxicam
Tenoxicam

Urology

1

Darifenacin
Fesoterodine
Mirabegron
Tamsulosin
Tolterodine

Other

1

Abrocitinib
Avatrombopag
Cevimeline
Elagolix
Eliglustat
Flibanserin

Overview

This pharmacogenetic information is based on best evidence compiled from guidelines and databases including the FDA Table of Pharmacogenetic Associations and the Clinical Pharmacogenetics Implementation Consortium (CPIC). In some cases, PharmGKB and the Dutch Pharmacogenetics Working Group (DPWG) may also be referenced.

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.

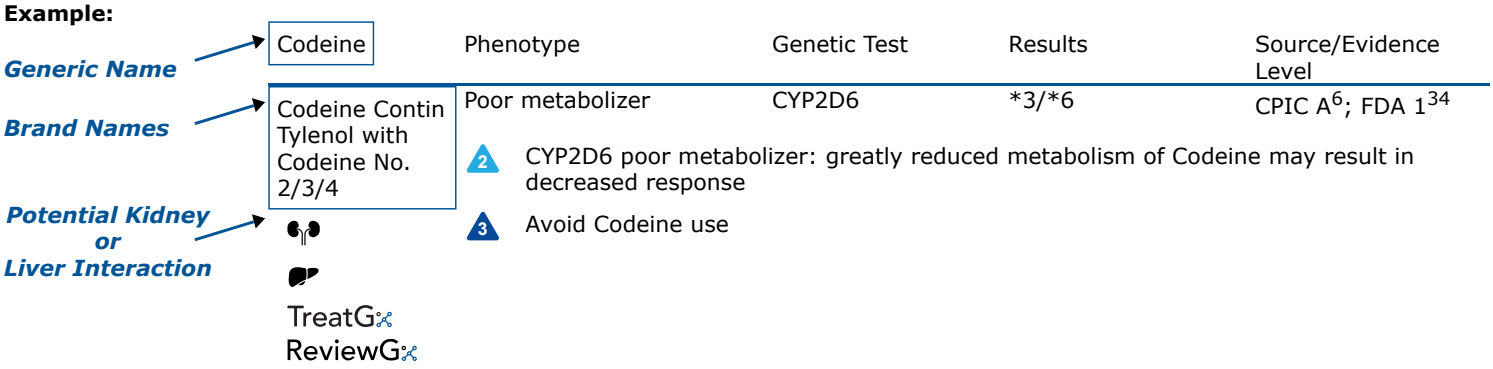
ReviewGx

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 Level 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.

Abacavir	Phenotype	Genetic Test	Results	Source/Evidence Level
Ziagen ReviewGx	Reduced risk of adverse drug reactions	HLA-B*57:01	Negative	CPIC A[31]; FDA 1[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CPIC – Implication: Low or reduced risk of abacavir hypersensitivity.

1 CPIC – Strong Recommendation: Use abacavir per standard dosing guidelines.

Abrocitinib	Phenotype	Genetic Test	Results	Source/Evidence Level
Cibinqo ReviewGx	Rapid metabolizer	CYP2C19	*1/*17	FDA 1[46]; Product monograph (actionable)[36]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 FDA PGx Table: No recommended changes or information for this phenotype in the FDA PGx Table

Allopurinol	Phenotype	Genetic Test	Results	Source/Evidence Level
Aloprim Lopurin Zyloprim TreatGx ReviewGx	Reduced risk of adverse drug reactions	HLA-B*58:01	Negative	CPIC A[41]; FDA 2[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CPIC – HLA-B*58:01 Implication: Low or reduced risk of allopurinol-induced severe cutaneous adverse reaction (SCAR).
CPIC – HLA-B*58:01 Strong Recommendation: Use allopurinol per standard dosing guidelines.

Amitriptyline	Phenotype	Genetic Test	Results	Source/Evidence Level
Elavil Levate TreatGx ReviewGx	Normal metabolizer	CYP2D6	*1/*1	CPIC A[24]; FDA 3[46]
	Rapid metabolizer	CYP2C19	*1/*17	CPIC A[24]

Drug-Gene Interactions:

Moderate drug-gene interaction: consider alternative medications, may reduce efficacy, may increase adverse events

2 CPIC – CYP2D6 Implication: Normal metabolism of TCAs.

2 CPIC – CYP2C19 Implication: Increased metabolism of tertiary amines compared to normal metabolizers. Greater conversion of tertiary amines to secondary amines may affect response or side effects.

2 CPIC – Optional Recommendation: Consider alternative drug not metabolized by CYP2C19. If use is warranted, utilize therapeutic drug monitoring to guide dose adjustment. TCAs without major CYP2C19 metabolism include the secondary amines nortriptyline and desipramine.
Recommendations above only apply to higher initial doses of TCAs for treatment of conditions such as depression. Lower dosages are often used for neuropathic pain compared to depressive disorders.
There are limited data to support dose recommendations for CYP2C19*17 carriers who are prescribed TCAs at lower doses for neuropathic pain treatment.

Amoxapine	Phenotype	Genetic Test	Results	Source/Evidence Level
ReviewGx	Normal metabolizer	CYP2D6	*1/*1	FDA 3[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 FDA PGx Table: No recommended changes or information for this phenotype in the FDA PGx Table

Amphetamine	Phenotype	Genetic Test	Results	Source/Evidence Level
Adderall Adzenys Dyanavel Evekeo Mydayis TreatGx ReviewGx	Normal metabolizer	CYP2D6	*1/*1	FDA 1[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2D6 alleles do not indicate changes from recommended dose

Aripiprazole	Phenotype	Genetic Test	Results	Source/Evidence Level
Abilify TreatGx ReviewGx	Normal metabolizer	CYP2D6	*1/*1	FDA 1[46]; Product monograph (actionable)[42]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 FDA PGx Table: No recommended changes or information for this CYP2D6 phenotype in the FDA PGx Table

Aripiprazole lauroxil	Phenotype	Genetic Test	Results	Source/Evidence Level
Aristada TreatGx ReviewGx	Normal metabolizer	CYP2D6	*1/*1	FDA 1[46]; Product monograph (actionable)[2]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 FDA PGx Table: No recommended changes or information for this CYP2D6 phenotype in the FDA PGx Table

Atazanavir	Phenotype	Genetic Test	Results	Source/Evidence Level
Reyataz ReviewGx	Normal/Extensive metabolizer	UGT1A1	*1/*1	CPIC A[19]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CPIC – Implication: Reference UGT1A1 activity; very low likelihood of bilirubin-related discontinuation of atazanavir.

1 CPIC – Strong Recommendation: There is no need to avoid prescribing of atazanavir based on UGT1A1 genetic test result. Inform the patient that some patients stop atazanavir because of jaundice (yellow eyes and skin), but that this patient's genotype makes this unlikely (less than about a 1 in 20 chance of stopping atazanavir because of jaundice).
All studies correlating UGT1A1 genotypes with atazanavir adverse events have involved ritonavir boosting. However, concentration-time profiles are equivalent when boosted with either cobicistat or ritonavir (PMID 23532097), and bilirubin-related adverse events including discontinuation of atazanavir occur in a similar percentage of patients prescribed atazanavir with cobicistat or ritonavir (PMID 23532097). Associations between UGT1A1 genotype, bilirubin elevations, and atazanavir/ritonavir discontinuation therefore almost certainly translate to atazanavir/cobicistat.

Atomoxetine	Phenotype	Genetic Test	Results	Source/Evidence Level
Strattera	Normal metabolizer	CYP2D6 (Activity Score)	*1/*1	CPIC A[11]; FDA 1[46]

TreatGx ReviewGx

Drug-Gene Interactions:

Moderate drug-gene interaction: may require an increased dose, may reduce efficacy

2 CPIC – Implication: Normal metabolizers of atomoxetine have a lower likelihood of response as compared to poor metabolizers. This is associated with increased discontinuation due to lack of efficacy as compared to poor metabolizers.

2 ADULTS: CPIC – Moderate Recommendation: Initiate with a dose of 40 mg/day and increase to 80 mg/day after 3 days. If no clinical response and in the absence of adverse events after 2 weeks, consider increasing dose to 100 mg/day. If no clinical response observed after 2 weeks, consider obtaining a peak plasma concentration (1 to 2 hours after dose administered). If <200 ng/mL, consider a proportional increase in dose to approach 400 ng/mL. Dosages greater than 100 mg/day may be needed to achieve target concentrations.
PEDIATRICS: CPIC – Moderate Recommendation: Initiate with a dose of 0.5 mg/kg/day and increase to 1.2 mg/kg/day after 3 days. If no clinical response and in the absence of adverse events after 2 weeks, consider obtaining a peak plasma concentration (1 to 2 hours after dose administered). If < 200 ng/mL, consider a proportional increase in dose to approach 400 ng/mL.
Notes (Adult & Pediatrics): Therapeutic range of 200 to 1000 ng/mL has been proposed (PMID 29493375). Limited data are available regarding the relationship between atomoxetine plasma concentrations and clinical response. Available information suggests that clinical response is greater in poor metabolizers (PMs) compared to non-PMs and may be related to the higher plasma concentrations 1 to 1.5 hours after dosing in PMs compared to non-PMs administered a similar dose. Furthermore, modest improvement in response, defined as reduction in ADHD-rating scale, is observed at peak concentrations greater than 400 ng/mL. Doses above 120 mg/day have not been evaluated.

Atorvastatin	Phenotype	Genetic Test	Results	Source/Evidence Level
Lipitor	Decreased function	SLCO1B1	*1/*5	CPIC A[13]; FDA 3[46]

TreatGx ReviewGx

Drug-Gene Interactions:

Moderate drug-gene interaction: may require a reduced dose, may increase adverse events

2 CPIC – SLCO1B1 Implication: Increased Atorvastatin exposure as compared with normal function, which may translate to increased myopathy risk.

2 CPIC – SLCO1B1 Moderate Recommendation: Prescribe ≤40 mg as a starting dose and adjust doses of atorvastatin based on disease-specific guidelines. Prescriber should be aware of possible increased risk for myopathy especially for 40 mg dose. If dose >40 mg needed for desired efficacy, consider combination therapy (i.e., atorvastatin plus non-statin guideline-directed medical therapy).
The potential for drug-drug interactions and dose limits based on renal and hepatic function should be evaluated prior to initiating a statin. The effects of drug-drug interactions may be more pronounced, resulting in a higher risk of myopathy.

Avatrombopag	Phenotype	Genetic Test	Results	Source/Evidence Level
Doptelet	Normal metabolizer	CYP2C9	*1/*1	FDA 3[46]

ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 FDA PGx Table: No recommended changes or information for this CYP2C9 phenotype in the FDA PGx Table

Azathioprine	Phenotype	Genetic Test	Results	Source/Evidence Level
Azasan Imuran	Normal metabolizer	TPMT	*1/*1	CPIC A[39,44]; FDA 1[46]
	Normal metabolizer	NUDT15	*1/*1	CPIC A[39,44]; FDA 1[46]

TreatGx
ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

- CPIC – TPMT Implication: Lower concentrations of thioguanine nucleotides metabolites, higher metabolites of thiopurine methyltransferase, this is the 'normal' pattern. Normal risk of thiopurine-related leukopenia, neutropenia, myelosuppression.
- CPIC – NUDT15 Implication: Normal risk of thiopurine-related leukopenia, neutropenia, myelosuppression.
- CPIC – Strong Recommendation: Start with normal starting dose (e.g., 2-3 mg/kg/day) and adjust doses of azathioprine based on disease-specific guidelines. Allow 2 weeks to reach steady-state after each dose adjustment.
  Normal starting doses vary by race/ethnicity and treatment regimens.

Brexpiprazole	Phenotype	Genetic Test	Results	Source/Evidence Level
Rexulti	Normal metabolizer	CYP2D6	*1/*1	FDA 1[46]; Product monograph (actionable)[3]

TreatGx
ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

- FDA PGx Table: No recommended changes or information for this CYP2D6 phenotype in the FDA PGx Table

Brivaracetam	Phenotype	Genetic Test	Results	Source/Evidence Level
Briviact Brivlera	Rapid metabolizer	CYP2C19	*1/*17	FDA 1[46]

ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

- CYP2C19 alleles do not indicate changes from recommended dose

Capecitabine	Phenotype	Genetic Test	Results	Source/Evidence Level
Xeloda	Normal metabolizer	DPYD	WT/WT	CPIC A[4]; FDA 1[46]

ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

- CPIC – Implication: Normal DPD activity and "normal" risk for fluoropyrimidine toxicity.
- CPIC – Strong Recommendation: Based on genotype, there is no indication to change dose or therapy. Use label-recommended dosage and administration.

Carbamazepine	Phenotype	Genetic Test	Results	Source/Evidence Level
Carbatrol Epitol Equetro Tegretol Teril	Increased risk of adverse drug reactions	HLA-A*31:01	Positive	CPIC A[38]; FDA 2[46]
	Reduced risk of adverse drug reactions	HLA-B*15:02	Negative	CPIC A[38]; FDA 1[46]

TreatG
ReviewG

Drug-Gene Interactions:

Serious drug-gene interaction: avoid/select alternative

3 CPIC – HLA-A*31:01 Implication: Greater risk of carbamazepine-induced Stevens-Johnson syndrome and toxic epidermal necrolysis (SJS/TEN), drug reaction with eosinophilia and systemic symptoms (DRESS), and maculopapular exanthema (MPE).

3 CPIC – HLA-A*31:01 Strong Recommendation: If patient is carbamazepine-naïve and alternative agents are available, do not use carbamazepine.
CPIC – Optional Recommendation: If patient is carbamazepine-naïve and alternative agents are not available, consider the use of carbamazepine with increased frequency of clinical monitoring. Discontinue therapy at first evidence of a cutaneous adverse reaction.
CPIC – Optional Recommendation: The latency period for cutaneous adverse drug reactions is variable depending on phenotype; however, all usually occur within three months of regular dosing. Therefore, if the patient has previously used carbamazepine consistently for longer than three months without incidence of cutaneous adverse reactions, cautiously consider use of carbamazepine.
Other aromatic anticonvulsants have very limited evidence, if any, linking SJS/ TEN, DRESS, and/or MPE with the HLA-A*31:01 allele, and thus no recommendation can be made with respect to choosing another aromatic anticonvulsant as an alternative agent. Previous tolerance of carbamazepine is not indicative of tolerance to other aromatic anticonvulsants. Aromatic anticonvulsants include carbamazepine, oxcarbazepine, eslicarbazepine, lamotrigine, phenytoin, fosphenytoin, and phenobarbital.

Carisoprodol	Phenotype	Genetic Test	Results	Source/Evidence Level
	Rapid metabolizer	CYP2C19	*1/*17	FDA 3[46]

ReviewG

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2C19 alleles do not indicate changes from recommended dose

Carvedilol	Phenotype	Genetic Test	Results	Source/Evidence Level
Coreg	Normal metabolizer	CYP2D6	*1/*1	FDA 2[46]

TreatG
ReviewG

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2D6 alleles do not indicate changes from recommended dose

Celecoxib	Phenotype	Genetic Test	Results	Source/Evidence Level
Celebrex	Normal metabolizer	CYP2C9 (Star Alleles)	*1/*1	CPIC A[45]; FDA 1[46]

TreatG
ReviewG

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2C9 alleles do not indicate changes from recommended dose

Cevimeline	Phenotype	Genetic Test	Results	Source/Evidence Level
Evoxac ReviewGx	Normal metabolizer	CYP2D6	*1/*1	FDA 2[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2D6 alleles do not indicate changes from recommended dose

Citalopram	Phenotype	Genetic Test	Results	Source/Evidence Level
Celexa TreatGx ReviewGx	Rapid metabolizer	CYP2C19	*1/*17	CPIC A[10]; FDA 1[46]

Drug-Gene Interactions:

Moderate drug-gene interaction: consider alternative medications, may require an increased dose, may reduce efficacy

2 Increase in metabolism of citalopram and escitalopram to less active compounds when compared with CYP2C19 normal metabolizers. Lower plasma concentrations decrease the probability of clinical benefit.

2 Initiate therapy with recommended starting dose. If patient does not adequately respond to recommended maintenance dosing, consider titrating to a higher maintenance dose or switching to a clinically appropriate alternative antidepressant not predominantly metabolized by CYP2C19 (per CPIC optional recommendation).

Clobazam	Phenotype	Genetic Test	Results	Source/Evidence Level
Onfi Sympazan ReviewGx	Rapid metabolizer	CYP2C19	*1/*17	FDA 1[46]; Product monograph (actionable)[30]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 FDA PGx Table: No recommended changes or information for this CYP2C19 phenotype in the FDA PGx Table

Clomipramine	Phenotype	Genetic Test	Results	Source/Evidence Level
Anafranil ReviewGx	Normal metabolizer	CYP2D6	*1/*1	CPIC B[24]; FDA 3[46]
	Rapid metabolizer	CYP2C19	*1/*17	CPIC B[24]

Drug-Gene Interactions:

Moderate drug-gene interaction: consider alternative medications, may reduce efficacy, may increase adverse events

2 CPIC – CYP2D6 Implication: Normal metabolism of TCAs.

2 CPIC – CYP2C19 Implication: Increased metabolism of tertiary amines compared to normal metabolizers. Greater conversion of tertiary amines to secondary amines may affect response or side effects.

2 CPIC – Optional Recommendation: Consider alternative drug not metabolized by CYP2C19. If use is warranted, utilize therapeutic drug monitoring to guide dose adjustment. TCAs without major CYP2C19 metabolism include the secondary amines nortriptyline and desipramine.
Recommendations above only apply to higher initial doses of TCAs for treatment of conditions such as depression. Lower dosages are often used for neuropathic pain compared to depressive disorders. There are limited data to support dose recommendations for CYP2C19*17 carriers who are prescribed TCAs at lower doses for neuropathic pain treatment.

Clopidogrel	Phenotype	Genetic Test	Results	Source/Evidence Level
Plavix	Rapid metabolizer	CYP2C19	*1/*17	CPIC A[28]; FDA 1[46]

TreatGx
ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CPIC – Implication: Normal or increased clopidogrel active metabolite formation; normal or lower on-treatment platelet reactivity; no association with higher bleeding risk.

1 CPIC – Strong Recommendation for acute coronary syndrome (ACS) and/or percutaneous coronary intervention (PCI): If considering clopidogrel, use at standard dose (75 mg/day).
No recommendation for non-ACS, non-PCI cardiovascular indications. ACS and/or PCI includes patients undergoing PCI for an ACS or non-ACS (elective) indication. Non-ACS, non-PCI cardiovascular indications include peripheral arterial disease and stable coronary artery disease following a recent myocardial infarction outside the setting of PCI.

Clozapine	Phenotype	Genetic Test	Results	Source/Evidence Level
Clozaril Fazaclo ODT Versacloz	Normal metabolizer	CYP2D6	*1/*1	FDA 1[46]

TreatGx
ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 FDA PGx Table: No recommended changes or information for this CYP2D6 phenotype in the FDA PGx Table

Codeine	Phenotype	Genetic Test	Results	Source/Evidence Level
Codeine Contin Tylenol with Codeine No. 2/3/4	Normal metabolizer	CYP2D6	*1/*1	CPIC A[14]; FDA 1[46]; FDA 2[46]

TreatGx
ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CPIC – Implication: Expected morphine formation.

1 CPIC – Strong Recommendation: Use codeine label recommended age-specific or weight-specific dosing.

Cyclosporine	Phenotype	Genetic Test	Results	Source/Evidence Level
Neoral Sandimmune	Poor metabolizer	CYP3A5	*3/*3	PharmGKB 3[47,48]

ReviewGx

Drug-Gene Interactions:

Moderate drug-gene interaction: may require a reduced dose

2 PharmGKB – Clinical Annotation (Level 3 Dosage): Patients who are recipients of a kidney transplant and who carry the *3 allele in combination with another no function allele may have decreased cyclosporine dose requirements as compared to patients carrying two normal function alleles or a normal function allele in combination with a no function allele. However, conflicting evidence has been reported. Other genetic and clinical factors may also affect cyclosporine dose requirements. (PharmGKB does not provide information about other poor metabolizer diplotypes without *3 i.e. *6/*6, *7/*7, *6/*7).

Darifenacin	Phenotype	Genetic Test	Results	Source/Evidence Level
Enablex	Normal metabolizer	CYP2D6	*1/*1	FDA 3[46]

TreatGx
ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2D6 alleles do not indicate changes from recommended dose

Desipramine	Phenotype	Genetic Test	Results	Source/Evidence Level
Norpramin TreatGx ReviewGx	Normal metabolizer	CYP2D6	*1/*1	CPIC B[24]; FDA 3[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CPIC – CYP2D6 Implication: Normal metabolism of TCAs.

1 CPIC – Strong Recommendation: Initiate therapy with recommended starting dose. Patients may receive an initial low dose of a tricyclic, which is then increased over several days to the recommended steady-state dose. The starting dose in this guideline refers to the recommended steady-state dose.

Deutetrabenazine	Phenotype	Genetic Test	Results	Source/Evidence Level
Austedo ReviewGx	Normal metabolizer	CYP2D6	*1/*1	FDA 1[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2D6 alleles do not indicate changes from recommended dose

Dexlansoprazole	Phenotype	Genetic Test	Results	Source/Evidence Level
Dexilant TreatGx ReviewGx	Rapid metabolizer	CYP2C19	*1/*17	CPIC B[29]; FDA 3[46]

Drug-Gene Interactions:

Moderate drug-gene interaction: may require an increased dose, may reduce efficacy

2 CPIC – Implication: Decreased plasma concentrations of PPIs compared with CYP2C19 NMs; increased risk of therapeutic failure.

2 CPIC – Moderate Recommendation: Initiate standard starting daily dose. Consider increasing dose by 50–100% for the treatment of Helicobacter pylori infection and erosive esophagitis. Daily dose may be given in divided doses. Monitor for efficacy.

Dextromethorphan/ Bupropion	Phenotype	Genetic Test	Results	Source/Evidence Level
Auvelity ReviewGx	Normal metabolizer	CYP2D6	*1/*1	Product monograph (actionable)[6]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 FDA Product Monograph: no recommended changes or information for this CYP2D6 phenotype in the FDA Product Monograph.

Dextromethorphan/ Quinidine	Phenotype	Genetic Test	Results	Source/Evidence Level
Nuedexta ReviewGx	Normal metabolizer	CYP2D6	*1/*1	Product monograph (actionable)[5]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 FDA Product Monograph: no recommended changes or information for this CYP2D6 phenotype in the FDA Product Monograph.

Diazepam	Phenotype	Genetic Test	Results	Source/Evidence Level
Diastat Valium	Rapid metabolizer	CYP2C19	*1/*17	FDA 3[46]

TreatG
ReviewG

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 FDA PGx Table: No recommended changes or information for this CYP2C19 phenotype in the FDA PGx Table

Donepezil	Phenotype	Genetic Test	Results	Source/Evidence Level
Aricept	Normal metabolizer	CYP2D6	*1/*1	FDA 3[46]

TreatG
ReviewG

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2D6 alleles do not indicate changes from recommended dose

Doxepin	Phenotype	Genetic Test	Results	Source/Evidence Level
Silenor Sinequan	Normal metabolizer	CYP2D6	*1/*1	CPIC B[24]; FDA 3[46]
	Rapid metabolizer	CYP2C19	*1/*17	CPIC B[24]; FDA 3[46]

TreatG
ReviewG

Drug-Gene Interactions:

Moderate drug-gene interaction: consider alternative medications, may reduce efficacy, may increase adverse events

2 CPIC – CYP2D6 Implication: Normal metabolism of TCAs.

2 CPIC – CYP2C19 Implication: Increased metabolism of tertiary amines compared to normal metabolizers. Greater conversion of tertiary amines to secondary amines may affect response or side effects.

2 CPIC – Optional Recommendation: Consider alternative drug not metabolized by CYP2C19. If use is warranted, utilize therapeutic drug monitoring to guide dose adjustment. TCAs without major CYP2C19 metabolism include the secondary amines nortriptyline and desipramine.
Recommendations above only apply to higher initial doses of TCAs for treatment of conditions such as depression. Lower dosages are often used for neuropathic pain compared to depressive disorders. There are limited data to support dose recommendations for CYP2C19*17 carriers who are prescribed TCAs at lower doses for neuropathic pain treatment.

Dronabinol	Phenotype	Genetic Test	Results	Source/Evidence Level
Marinol Syndros	Normal metabolizer	CYP2C9	*1/*1	FDA 1[46]

ReviewG

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2C9 alleles do not indicate changes from recommended dose

Efavirenz	Phenotype	Genetic Test	Results	Source/Evidence Level
Sustiva	Normal metabolizer	CYP2B6	*1/*1	CPIC A[15]; FDA 2[46]

ReviewG

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CPIC – Implication: Normal efavirenz metabolism.

1 CPIC – Strong Recommendation: Initiate efavirenz with standard dosing (600 mg/day in children ≥40 kg and adult patients).
The ENCORE study showed that in treatment-naïve patients randomized to initiate efavirenz-based regimens (combined with tenofovir and emtricitabine), 400 mg/day was non-inferior to 600 mg/day regardless of CYP2B6 genotype (PMID 24522178).

Elagolix	Phenotype	Genetic Test	Results	Source/Evidence Level
Orilissa	Decreased function	SLCO1B1	*1/*5	FDA 3[46]

ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 SLCO1B1 alleles indicate a typical response to Elagolix

Eliglustat	Phenotype	Genetic Test	Results	Source/Evidence Level
Cerdelga	Normal metabolizer	CYP2D6	*1/*1	FDA 1[46]

ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2D6 alleles do not indicate changes from recommended dose

1 Multiple drug-drug interactions may further affect the safety of Eliglustat, refer to drug monograph or FDA labelling for dosing recommendations

Erdafitinib	Phenotype	Genetic Test	Results	Source/Evidence Level
Balversa	Normal metabolizer	CYP2C9 (Star Alleles)	*1/*1	FDA 1[46]

ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 FDA PGx Table: No recommended changes or information for this CYP2C9 star allele result in the FDA PGx Table

Escitalopram	Phenotype	Genetic Test	Results	Source/Evidence Level
Cipralex Lexapro	Rapid metabolizer	CYP2C19	*1/*17	CPIC A[10]; FDA 3[46]

TreatGx
ReviewGx

Drug-Gene Interactions:

Moderate drug-gene interaction: consider alternative medications, may require an increased dose, may reduce efficacy

2 Increase in metabolism of citalopram and escitalopram to less active compounds when compared with CYP2C19 normal metabolizers. Lower plasma concentrations decrease the probability of clinical benefit.

2 Initiate therapy with recommended starting dose. If patient does not adequately respond to recommended maintenance dosing, consider titrating to a higher maintenance dose or switching to a clinically appropriate alternative antidepressant not predominantly metabolized by CYP2C19 (per CPIC optional recommendation).

Esomeprazole	Phenotype	Genetic Test	Results	Source/Evidence Level
Nexium	Rapid metabolizer	CYP2C19	*1/*17	FDA 3[46]

TreatGx
ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 FDA PGx Table: No recommended changes or information for this phenotype in the FDA PGx Table

Fesoterodine	Phenotype	Genetic Test	Results	Source/Evidence Level
Toviaz	Normal metabolizer	CYP2D6	*1/*1	FDA 3[46]

TreatGx
ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2D6 alleles do not indicate changes from recommended dose

Flecainide	Phenotype	Genetic Test	Results	Source/Evidence Level
Tambocor	Normal metabolizer	CYP2D6	*1/*1	DPWG[17]

TreatGx ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2D6 alleles do not indicate changes from recommended dose

Flibanserin	Phenotype	Genetic Test	Results	Source/Evidence Level
Addyi	Rapid metabolizer	CYP2C19	*1/*17	FDA 1[46]

ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2C19 alleles do not indicate changes from recommended dose

Fluorouracil	Phenotype	Genetic Test	Results	Source/Evidence Level
Carac Efudex Fluoroplex Tolak	Normal metabolizer	DPYD	WT/WT	CPIC A[4]; FDA 1[46]

ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CPIC – Implication: Normal DPD activity and "normal" risk for fluoropyrimidine toxicity.

1 CPIC – Strong Recommendation: Based on genotype, there is no indication to change dose or therapy. Use label-recommended dosage and administration.

Fluoxetine	Phenotype	Genetic Test	Results	Source/Evidence Level
Prozac	Normal metabolizer	CYP2D6	*1/*1	Product monograph (actionable)[12]

TreatGx ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 FDA Product Monograph: No recommended changes or information for this phenotype in the FDA Product Monograph

Flurbiprofen	Phenotype	Genetic Test	Results	Source/Evidence Level
Ansaid	Normal metabolizer	CYP2C9 (Star Alleles)	*1/*1	CPIC A[45]; FDA 1[46]

TreatGx ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2C9 alleles do not indicate changes from recommended dose

Fluvastatin	Phenotype	Genetic Test	Results	Source/Evidence Level
Lescol	Normal metabolizer	CYP2C9	*1/*1	CPIC A[13]
	Decreased function	SLCO1B1	*1/*5	CPIC A[13]

TreatGx
ReviewGx

Drug-Gene Interactions:

Moderate drug-gene interaction: may require a reduced dose, may increase adverse events

2 CPIC – CYP2C9 Implication: Normal exposure.

2 CPIC – SLCO1B1 Implication: Increased fluvastatin exposure as compared with normal function; typical myopathy risk with doses ≤40 mg.

2 CPIC – Moderate Recommendation: Prescribe desired starting dose and adjust doses of fluvastatin based on disease-specific guidelines. Prescriber should be aware of possible increased risk for myopathy especially for doses >40 mg per day.
The potential for drug-drug interactions and dose limits based on renal and hepatic function should be evaluated prior to initiating a statin. The effects of drug-drug interactions may be more pronounced, resulting in a higher risk of myopathy.

Fluvoxamine	Phenotype	Genetic Test	Results	Source/Evidence Level
Luvox	Normal metabolizer	CYP2D6	*1/*1	CPIC B[10]; FDA 3[46]

TreatGx
ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 Normal CYP2D6 metabolism

1 Initiate therapy with recommended starting dose (per CPIC strong recommendation).

Fosphenytoin	Phenotype	Genetic Test	Results	Source/Evidence Level
Cerebyx	Reduced risk of adverse drug reactions	HLA-B*15:02	Negative	CPIC A[27]; FDA 1[46]
	Normal metabolizer	CYP2C9	*1/*1	CPIC A[27]; FDA 1[46]

ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CPIC – CYP2C9 Implication: Normal Fosphenytoin metabolism

1 CPIC – Strong Recommendation: No adjustments needed from typical dosing strategies. Subsequent doses should be adjusted according to therapeutic drug monitoring, response, and side effects. An HLA-B*15:02 negative test does not eliminate the risk of Fosphenytoin-induced Stevens-Johnson syndrome and toxic epidermal necrolysis (SJS/TEN), and patients should be carefully monitored according to standard practice.

Galantamine	Phenotype	Genetic Test	Results	Source/Evidence Level
Razadyne	Normal metabolizer	CYP2D6	*1/*1	FDA 3[46]

TreatGx
ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2D6 alleles do not indicate changes from recommended dose

Gefitinib	Phenotype	Genetic Test	Results	Source/Evidence Level
Iressa ReviewGx	Normal metabolizer	CYP2D6	*1/*1	FDA 1[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 FDA PGx Table: No recommended changes or information for this phenotype in the FDA PGx Table

Haloperidol	Phenotype	Genetic Test	Results	Source/Evidence Level
Haldol TreatGx ReviewGx	Normal metabolizer	CYP2D6	*1/*1	DPWG[17]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 DPWG: no recommendation for this CYP2D6 phenotype.

Hydrocodone	Phenotype	Genetic Test	Results	Source/Evidence Level
Anexsia Hycodan Hysingla Zohydro TreatGx ReviewGx	Normal metabolizer	CYP2D6	*1/*1	CPIC B[14]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CPIC – Implication: Normal hydromorphone formation.

1 CPIC – Strong Recommendation: Use hydrocodone label recommended age-specific or weight-specific dosing.

Ibuprofen	Phenotype	Genetic Test	Results	Source/Evidence Level
Advil Caldolor Duexis Motrin IB NeoProfen TreatGx ReviewGx	Normal metabolizer	CYP2C9 (Star Alleles)	*1/*1	CPIC A[45]; FDA 3[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2C9 alleles do not indicate changes from recommended dose

Iloperidone	Phenotype	Genetic Test	Results	Source/Evidence Level
Fanapt TreatGx ReviewGx	Normal metabolizer	CYP2D6	*1/*1	FDA 1[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 FDA PGx Table: No recommended changes or information for this CYP2D6 phenotype in the FDA PGx Table

Imipramine	Phenotype	Genetic Test	Results	Source/Evidence Level
Tofranil	Normal metabolizer	CYP2D6	*1/*1	CPIC B[24]; FDA 3[46]
TreatGx	Rapid metabolizer	CYP2C19	*1/*17	CPIC B[24]
ReviewGx				

Drug-Gene Interactions:

Moderate drug-gene interaction: consider alternative medications, may reduce efficacy, may increase adverse events

2 CPIC – CYP2D6 Implication: Normal metabolism of TCAs.

2 CPIC – CYP2C19 Implication: Increased metabolism of tertiary amines compared to normal metabolizers. Greater conversion of tertiary amines to secondary amines may affect response or side effects.

2 CPIC – Optional Recommendation: Consider alternative drug not metabolized by CYP2C19. If use is warranted, utilize therapeutic drug monitoring to guide dose adjustment. TCAs without major CYP2C19 metabolism include the secondary amines nortriptyline and desipramine.
Recommendations above only apply to higher initial doses of TCAs for treatment of conditions such as depression. Lower dosages are often used for neuropathic pain compared to depressive disorders.
There are limited data to support dose recommendations for CYP2C19*17 carriers who are prescribed TCAs at lower doses for neuropathic pain treatment.

Irinotecan	Phenotype	Genetic Test	Results	Source/Evidence Level
Camptosar Onivyde	Normal/Extensive metabolizer	UGT1A1	*1/*1	DPWG[17]; FDA 1[46]; Product monograph (actionable)[25,37]
ReviewGx				

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 DPWG: no recommendation for this UGT1A1 phenotype.

1 FDA PGx Table: No recommended changes or information for this UGT1A1 phenotype in the FDA PGx Table

1 FDA Product Monograph: Consider UGT1A1 genotype testing for the *28 and *6 alleles to determine UGT1A1 metabolizer status. No recommended changes or information for this diplotype in the FDA Product Monograph

Lamotrigine	Phenotype	Genetic Test	Results	Source/Evidence Level
Lamictal	Reduced risk of adverse drug reactions	HLA-B*15:02	Negative	DPWG[17]
TreatGx	Reduced risk of adverse drug reactions	HLA-B*58:01	Negative	PharmGKB 3[47,48]
ReviewGx				

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 DPWG: no recommendation for this HLA-B*15:02 phenotype.

1 PharmGKB: No recommended changes or information for this HLA-B *58:01 phenotype in PharmGKB.

Lansoprazole	Phenotype	Genetic Test	Results	Source/Evidence Level
Prevacid	Rapid metabolizer	CYP2C19	*1/*17	CPIC A[29]; FDA 3[46]

TreatGx
ReviewGx

Drug-Gene Interactions:

Moderate drug-gene interaction: may require an increased dose, may reduce efficacy

2 CPIC – Implication: Decreased plasma concentrations of PPIs compared with CYP2C19 NMs; increased risk of therapeutic failure.

2 CPIC – Moderate Recommendation: Initiate standard starting daily dose. Consider increasing dose by 50–100% for the treatment of Helicobacter pylori infection and erosive esophagitis. Daily dose may be given in divided doses. Monitor for efficacy.

Lofexidine	Phenotype	Genetic Test	Results	Source/Evidence Level
Lucemyra	Normal metabolizer	CYP2D6	*1/*1	FDA 1[46]

ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2D6 alleles do not indicate changes from recommended dose

Lovastatin	Phenotype	Genetic Test	Results	Source/Evidence Level
Altoprev	Decreased function	SLCO1B1	*1/*5	CPIC A[13]

TreatGx
ReviewGx

Drug-Gene Interactions:

Serious drug-gene interaction: avoid/select alternative

3 CPIC – Implication: Increased lovastatin acid exposure as compared with normal function, which may translate to increased myopathy risk.

3 CPIC – Moderate Recommendation: Prescribe an alternative statin depending on the desired potency. If lovastatin therapy is warranted, limit dose to ≤20 mg/day.
The potential for drug-drug interactions and dose limits based on renal and hepatic function should be evaluated prior to initiating a statin. The effects of drug-drug interactions may be more pronounced, resulting in a higher risk of myopathy.

Mavacamten	Phenotype	Genetic Test	Results	Source/Evidence Level
Camzyos	Rapid metabolizer	CYP2C19	*1/*17	FDA 2[46]

ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 FDA PGx Table: No recommended changes or information for this phenotype in the FDA PGx Table

Meclizine	Phenotype	Genetic Test	Results	Source/Evidence Level
Antivert	Normal metabolizer	CYP2D6	*1/*1	FDA 1[46]

ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2D6 alleles do not indicate changes from recommended dose

Meloxicam	Phenotype	Genetic Test	Results	Source/Evidence Level
Anjeso Mobic Qmiiz ODT Vivlodex	Normal metabolizer	CYP2C9 (Star Alleles)	*1/*1	CPIC A[45]; FDA 1[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2C9 alleles do not indicate changes from recommended dose

TreatGx
ReviewGx

Mercaptopurine	Phenotype	Genetic Test	Results	Source/Evidence Level
Purinethol Purixan	Normal metabolizer	TPMT	*1/*1	CPIC A[39,44]; FDA 1[46]
	Normal metabolizer	NUDT15	*1/*1	CPIC A[39,44]; FDA 1[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CPIC – TPMT Implication: Lower concentrations of thioguanine nucleotides metabolites, higher metabolites of thiopurine methyltransferase, this is the 'normal' pattern. Normal risk of thiopurine-related leukopenia, neutropenia, myelosuppression.

1 CPIC – NUDT15 Implication: Normal risk of thiopurine-related leukopenia, neutropenia, myelosuppression.

1 CPIC – Strong Recommendation: Start with normal starting dose (e.g., 75 mg/m2/day or 1.5 mg/kg/day) and adjust doses of mercaptopurine (and of any other myelosuppressive therapy) without any special emphasis on mercaptopurine compared to other agents. Allow at least 2 weeks to reach steady-state after each dose adjustment.
Normal starting doses vary by race/ethnicity and treatment regimens.

TreatGx
ReviewGx

Methadone	Phenotype	Genetic Test	Results	Source/Evidence Level
Methadose	Normal metabolizer	CYP2B6	*1/*1	PharmGKB 2A[40,47,48]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CPIC – CYP2B6 Level C Implication, as adapted by PharmGKB (Level 2A Metabolism/PK Clinical Annotation): Normal metabolism and plasma concentrations of R-and S-methadone.
PharmGKB: Other genetic and clinical factors may also affect methadone metabolism. This annotation only covers the pharmacokinetic relationship between CYP2B6 and methadone and does not include evidence about clinical outcomes.

1 CPIC – CYP2B6 Strong Recommendation: Standard dosing, titration, and monitoring of methadone. Clinical guidelines for ECG monitoring in the context of methadone therapy, including risk assessment of other clinical factors, should be followed. None of the pharmacogenetic information in this guideline should be interpreted to influence the use of ECG monitoring guidelines.

ReviewGx

Metoclopramide	Phenotype	Genetic Test	Results	Source/Evidence Level
Metonia Reglan	Normal metabolizer	CYP2D6	*1/*1	FDA 1[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2D6 alleles do not indicate changes from recommended dose

TreatGx
ReviewGx

Metoprolol	Phenotype	Genetic Test	Results	Source/Evidence Level
Kapspargo Sprinkle Lopressor Toprol-XL	Normal metabolizer	CYP2D6	*1/*1	CPIC B[16]

TreatGx
ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CPIC – Implication: Normal metabolism of metoprolol.

1 CPIC – Strong Recommendation: Initiate standard dosing.

Mirabegron	Phenotype	Genetic Test	Results	Source/Evidence Level
Myrbetriq	Normal metabolizer	CYP2D6	*1/*1	FDA 3[46]

TreatGx
ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2D6 alleles do not indicate changes from recommended dose

Mirtazapine	Phenotype	Genetic Test	Results	Source/Evidence Level
Remeron	Normal metabolizer	CYP2D6	*1/*1	DPWG[17]; PharmGKB 2A[47,48]

TreatGx
ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 DPWG: no recommendation for this CYP2D6 phenotype.

Nateglinide	Phenotype	Genetic Test	Results	Source/Evidence Level
	Normal metabolizer	CYP2C9	*1/*1	FDA 1[46]

ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 FDA PGx Table: No recommended changes or information for this phenotype in the FDA PGx Table

Nebivolol	Phenotype	Genetic Test	Results	Source/Evidence Level
Bystolic	Normal metabolizer	CYP2D6	*1/*1	FDA 3[46]

TreatGx
ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2D6 alleles do not indicate changes from recommended dose

Nevirapine	Phenotype	Genetic Test	Results	Source/Evidence Level
Viramune	Decreased risk for SJS/TEN	CYP2B6 rs28399499	T/T	PharmGKB 2A[47,48]
	Increased clearance and decreased exposure	CYP2B6 rs3745274	G/G	PharmGKB 2A[47,48]

ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 PharmGKB – CYP2B6 Clinical Annotation (Level 2A Toxicity): Patients with the CYP2B6 rs28399499 T/T genotype and HIV may have a decreased risk for Stevens-Johnson Syndrome/toxic epidermal necrolysis (SJS/TEN) when treated with nevirapine as compared to patients with the C/C or C/T genotype. Other genetic and clinical factors may also influence risk for developing SJS/TEN when receiving nevirapine.

1 PharmGKB – CYP2B6 Clinical Annotation (Level 2A Metabolism/PK): Patients with the CYP2B6 rs3745274 G/G genotype and HIV infection may have increased clearance of and decreased exposure to nevirapine as compared to patients with the T/T or G/T genotype. However, conflicting evidence has been reported. Other genetic and clinical factors may also influence clearance of nevirapine and exposure to drug. This annotation only covers the pharmacokinetic relationship between CYP2B6 rs3745274 and nevirapine and does not include evidence about clinical outcomes.

Nortriptyline	Phenotype	Genetic Test	Results	Source/Evidence Level
Aventyl Pamelor	Normal metabolizer	CYP2D6	*1/*1	CPIC A[24]; FDA 3[46]

TreatGx
ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CPIC – CYP2D6 Implication: Normal metabolism of TCAs.

1 CPIC – Strong Recommendation: Initiate therapy with recommended starting dose. Patients may receive an initial low dose of a tricyclic, which is then increased over several days to the recommended steady-state dose. The starting dose in this guideline refers to the recommended steady-state dose.

Oliceridine	Phenotype	Genetic Test	Results	Source/Evidence Level
Olinvyk	Normal metabolizer	CYP2D6	*1/*1	FDA 1[46]

ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 FDA PGx Table: No recommended changes or information for this phenotype in the FDA PGx Table

Omeprazole	Phenotype	Genetic Test	Results	Source/Evidence Level
Losec Olex Prilosec	Rapid metabolizer	CYP2C19	*1/*17	CPIC A[29]; FDA 3[46]

TreatGx
ReviewGx

Drug-Gene Interactions:

Moderate drug-gene interaction: may require an increased dose, may reduce efficacy

2 CPIC – Implication: Decreased plasma concentrations of PPIs compared with CYP2C19 NMs; increased risk of therapeutic failure.

2 CPIC – Moderate Recommendation: Initiate standard starting daily dose. Consider increasing dose by 50–100% for the treatment of Helicobacter pylori infection and erosive esophagitis. Daily dose may be given in divided doses. Monitor for efficacy.

Ondansetron	Phenotype	Genetic Test	Results	Source/Evidence Level
Zofran Zuplenz	Normal metabolizer	CYP2D6	*1/*1	CPIC A[7]

ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CPIC – Implication: Normal metabolism.

1 CPIC – Strong Recommendation: Initiate therapy with recommended starting dose. Drug-drug interactions and other patient characteristics (e.g., age, renal function, and liver function) should be considered when selecting alternative therapy.

Oxcarbazepine	Phenotype	Genetic Test	Results	Source/Evidence Level
Oxtellar XR Trileptal	Reduced risk of adverse drug reactions	HLA-B*15:02	Negative	CPIC A[38]; FDA 2[46]

TreatGx
ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CPIC – Implication: Normal risk of oxcarbazepine-induced Stevens-Johnson syndrome and toxic epidermal necrolysis (SJS/TEN).

1 CPIC – Strong Recommendation: Use oxcarbazepine per standard dosing guidelines.

Oxycodone	Phenotype	Genetic Test	Results	Source/Evidence Level
OxyContin Roxicodone Roxybond Xtampza ER	Normal metabolizer	CYP2D6	*1/*1	PharmGKB 2A[14,47,48]

TreatGx
ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CPIC – CYP2D6 Level C Implication, as adapted by PharmGKB (Level 2A Metabolism/PK Clinical Annotation): Expected oxymorphone formation.
PharmGKB: This annotation only covers the pharmacokinetic relationship between CYP2D6 and oxycodone and does not include evidence about clinical outcomes. This drug-variant pair has been assigned a "no recommendation" by CPIC and DPWG, as it was determined to be not clinically actionable. Other genetic and clinical factors may also affect oxycodone metabolism.

1 CPIC – CYP2D6 Strong Recommendation: Use oxycodone label recommended age- or weight-specific dosing.

Pantoprazole	Phenotype	Genetic Test	Results	Source/Evidence Level
Pantoloc Protonix Tecta	Rapid metabolizer	CYP2C19	*1/*17	CPIC A[29]; FDA 1[46]

TreatGx
ReviewGx

Drug-Gene Interactions:

Moderate drug-gene interaction: may require an increased dose, may reduce efficacy

2 CPIC – Implication: Decreased plasma concentrations of PPIs compared with CYP2C19 NMs; increased risk of therapeutic failure.

2 CPIC – Moderate Recommendation: Initiate standard starting daily dose. Consider increasing dose by 50–100% for the treatment of Helicobacter pylori infection and erosive esophagitis. Daily dose may be given in divided doses. Monitor for efficacy.

Paroxetine	Phenotype	Genetic Test	Results	Source/Evidence Level
Brisdelle Paxil Pexeva	Normal metabolizer	CYP2D6	*1/*1	CPIC A[10]; FDA 3[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

TreatGx
ReviewGx

1 Normal metabolism of paroxetine to less active compounds. Paroxetine-associated phenoconversion of normal metabolizers to intermediate or poor metabolizers due to CYP2D6 autoinhibition may occur and is dose-dependent and greater at steady state concentrations.

1 Initiate therapy with recommended starting dose (per CPIC strong recommendation).

Pazopanib	Phenotype	Genetic Test	Results	Source/Evidence Level
Votrient	Reduced risk of adverse drug reactions	HLA-B*57:01	Negative	FDA 2[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

ReviewGx

1 FDA PGx Table: No recommended changes or information for this HLA-B *57:01 phenotype in the FDA PGx Table

Perphenazine	Phenotype	Genetic Test	Results	Source/Evidence Level
	Normal metabolizer	CYP2D6	*1/*1	FDA 2[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

TreatGx
ReviewGx

1 FDA PGx Table: No recommended changes or information for this CYP2D6 phenotype in the FDA PGx Table

Phenytoin	Phenotype	Genetic Test	Results	Source/Evidence Level
Dilantin Tremytoine Phenytek	Reduced risk of adverse drug reactions	HLA-B*15:02	Negative	CPIC A[27]; FDA 1[46]
	Normal metabolizer	CYP2C9	*1/*1	CPIC A[27]; FDA 1[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

ReviewGx

1 CPIC – CYP2C9 Implication: Normal Phenytoin metabolism

1 CPIC – Strong Recommendation: No adjustments needed from typical dosing strategies. Subsequent doses should be adjusted according to therapeutic drug monitoring, response, and side effects. An HLA-B*15:02 negative test does not eliminate the risk of Phenytoin-induced Stevens-Johnson syndrome and toxic epidermal necrolysis (SJS/TEN), and patients should be carefully monitored according to standard practice.

Pimozide	Phenotype	Genetic Test	Results	Source/Evidence Level
Orap	Normal metabolizer	CYP2D6	*1/*1	FDA 1[46]

TreatGx
ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 FDA PGx Table: No recommended changes or information for this CYP2D6 phenotype in the FDA PGx Table

Piroxicam	Phenotype	Genetic Test	Results	Source/Evidence Level
Feldene TreatGx ReviewGx	Normal metabolizer	CYP2C9 (Star Alleles)	*1/*1	CPIC A[45]; FDA 1[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2C9 alleles do not indicate changes from recommended dose

Pitavastatin	Phenotype	Genetic Test	Results	Source/Evidence Level
Livalo Zypitamag TreatGx ReviewGx	Decreased function	SLCO1B1	*1/*5	CPIC A[13]

Drug-Gene Interactions:

Moderate drug-gene interaction: consider alternative medications, may require a reduced dose, may increase adverse events

2 CPIC – Implication: Increased Pitavastatin exposure as compared with normal function, which may translate to increased myopathy risk.

2 CPIC – Moderate Recommendation: Prescribe ≤2 mg as a starting dose and adjust doses of pitavastatin based on disease-specific guidelines. Prescriber should be aware of possible increased risk for myopathy especially for doses >1 mg. If dose >2 mg needed for desired efficacy, consider an alternative statin or combination therapy (i.e., pitavastatin plus non-statin guideline-directed medical therapy).
The potential for drug-drug interactions and dose limits based on renal and hepatic function should be evaluated prior to initiating a statin. The effects of drug-drug interactions may be more pronounced, resulting in a higher risk of myopathy.

Pitolisant	Phenotype	Genetic Test	Results	Source/Evidence Level
Wakix ReviewGx	Normal metabolizer	CYP2D6	*1/*1	FDA 1[46]; Product monograph (actionable)[23]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 FDA PGx Table: No recommended changes or information for this phenotype in the FDA PGx Table

Pravastatin	Phenotype	Genetic Test	Results	Source/Evidence Level
Pravachol TreatGx ReviewGx	Decreased function	SLCO1B1	*1/*5	CPIC A[13]

Drug-Gene Interactions:

Moderate drug-gene interaction: may require a reduced dose, may increase adverse events

2 CPIC – Implication: Increased pravastatin exposure as compared with normal function; typical myopathy risk with doses ≤40 mg.

2 CPIC – Moderate Recommendation: Prescribe desired starting dose and adjust doses of pravastatin based on disease-specific guidelines. Prescriber should be aware of possible increased risk for myopathy with pravastatin especially with doses >40 mg per day.
The potential for drug-drug interactions and dose limits based on renal and hepatic function should be evaluated prior to initiating a statin. The effects of drug-drug interactions may be more pronounced, resulting in a higher risk of myopathy.

Propafenone	Phenotype	Genetic Test	Results	Source/Evidence Level
Rythmol TreatGx ReviewGx	Normal metabolizer	CYP2D6	*1/*1	DPWG[17]; FDA 1[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2D6 alleles do not indicate changes from recommended dose

Propranolol	Phenotype	Genetic Test	Results	Source/Evidence Level
Inderal Innopran	Normal metabolizer	CYP2D6	*1/*1	FDA 3[46]

TreatGx
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Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2D6 alleles do not indicate changes from recommended dose

Protriptyline	Phenotype	Genetic Test	Results	Source/Evidence Level
Vivactil	Normal metabolizer	CYP2D6	*1/*1	FDA 3[46]

ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2D6 alleles do not indicate changes from recommended dose

Quetiapine	Phenotype	Genetic Test	Results	Source/Evidence Level
Seroquel	Normal metabolizer	CYP3A4	*1/*1	DPWG[17]

TreatGx
ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 DPWG: no recommendation for this CYP3A4 phenotype.

Rabeprazole	Phenotype	Genetic Test	Results	Source/Evidence Level
Aciphex Pariet	Rapid metabolizer	CYP2C19	*1/*17	FDA 3[46]

TreatGx
ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 FDA PGx Table: No recommended changes or information for this phenotype in the FDA PGx Table

Risperidone	Phenotype	Genetic Test	Results	Source/Evidence Level
Perseris Risperdal	Normal metabolizer	CYP2D6	*1/*1	DPWG[17]; FDA 3[46]

TreatGx
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Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 FDA PGx Table: No recommended changes or information for this CYP2D6 phenotype in the FDA PGx Table

1 DPWG: no recommendation for this CYP2D6 phenotype.

Rosuvastatin	Phenotype	Genetic Test	Results	Source/Evidence Level
Crestor	Decreased function	SLCO1B1	*1/*5	CPIC A[13]; FDA 3[46]

TreatGx
ReviewGx

Drug-Gene Interactions:

Moderate drug-gene interaction: may require a reduced dose, may increase adverse events

2 CPIC – SLCO1B1 Implication: Increased rosuvastatin exposure as compared with normal function; typical myopathy risk with doses ≤20 mg.

2 CPIC – Strong Recommendation: Prescribe desired starting dose and adjust doses of rosuvastatin based on disease-specific and population-specific guidelines. Prescriber should be aware of possible increased risk for myopathy especially for doses >20 mg.
The potential for drug-drug interactions and dose limits based on renal and hepatic function and Asian ancestry should be evaluated prior to initiating a statin. The effects of drug-drug interactions may be more pronounced, resulting in a higher risk of myopathy.

Sertraline	Phenotype	Genetic Test	Results	Source/Evidence Level
Zoloft	Normal metabolizer	CYP2B6	*1/*1	CPIC B[10]
	Rapid metabolizer	CYP2C19	*1/*17	CPIC A[10]

TreatGx
ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 Normal CYP2B6 metabolism

1 Small increase in metabolism of sertraline to less active compounds when compared with CYP2C19 normal metabolizers.

1 Initiate therapy with recommended starting dose (per CPIC strong recommendation).

Simvastatin	Phenotype	Genetic Test	Results	Source/Evidence Level
Zocor Flolipid	Decreased function	SLCO1B1	*1/*5	CPIC A[13]; FDA 2[46]

Drug-Gene Interactions:

TreatGx
ReviewGx

Serious drug-gene interaction: avoid/select alternative

3 CPIC – Implication: Increased simvastatin acid exposure as compared with normal function; increased risk of myopathy.

3 CPIC – Strong Recommendation: Prescribe an alternative statin depending on the desired potency. If simvastatin therapy is warranted, limit dose to <20 mg/day.
The potential for drug-drug interactions and dose limits based on renal and hepatic function should be evaluated prior to initiating a statin. The effects of drug-drug interactions may be more pronounced, resulting in a higher risk of myopathy.

Siponimod	Phenotype	Genetic Test	Results	Source/Evidence Level
Mayzent	Normal metabolizer	CYP2C9 (Star Alleles)	*1/*1	FDA 1[46]

Drug-Gene Interactions:

ReviewGx

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2C9 alleles do not indicate changes from recommended dose

Tacrolimus	Phenotype	Genetic Test	Results	Source/Evidence Level
Advagraf Astagraf XL Envarsus XR Prograf Protopic	Poor metabolizer	CYP3A5	*3/*3	CPIC A[9]; FDA 1[46]
	Normal metabolizer	CYP3A4	*1/*1	PharmGKB 2A[47,48]

Drug-Gene Interactions:

ReviewGx

Moderate drug-gene interaction: may require an increased dose

1 CPIC – CYP3A5 Implication: Higher ("normal") dose-adjusted trough concentrations of tacrolimus and increased chance of achieving target tacrolimus concentrations.
CPIC – CYP3A5 Strong Recommendation: Initiate therapy with standard recommended dose. Use therapeutic drug monitoring to guide dose adjustments. This recommendation includes the use of tacrolimus in kidney, heart, lung, and hematopoietic stem cell transplant patients, and liver transplant patients in which the donor and recipient genotypes are identical.

2 PharmGKB – CYP3A4 Clinical Annotation (Level 2A Dosage): Patients who are recipients of an organ transplant and carry two copies of the CYP3A4*1 allele may require an increased dose of tacrolimus as compared to patients with two copies of the *3 or *22 alleles or one copy of the 1* allele in combination with one copy of the *3 or *22 alleles. Other genetic and clinical factors may also influence tacrolimus dose.

Tamoxifen	Phenotype	Genetic Test	Results	Source/Evidence Level
Nolvadex Soltamox ReviewGx	Normal metabolizer	CYP2D6 (Activity Score)	*1/*1	CPIC A[21]; FDA 3[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

- CPIC – Implication: Therapeutic endoxifen concentrations.
- CPIC – Strong Recommendation: Avoid moderate and strong CYP2D6 inhibitors. Initiate therapy with recommended standard of care dosing (tamoxifen 20 mg/day).
- FDA PGx Table: No recommended changes or information for this phenotype in the FDA PGx Table.

Tamsulosin	Phenotype	Genetic Test	Results	Source/Evidence Level
Flomax ReviewGx	Normal metabolizer	CYP2D6	*1/*1	FDA 3[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

- CYP2D6 alleles do not indicate changes from recommended dose

Tenoxicam	Phenotype	Genetic Test	Results	Source/Evidence Level
Mobiflex ReviewGx	Normal metabolizer	CYP2C9 (Star Alleles)	*1/*1	CPIC A[45]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

- CYP2C9 alleles do not indicate changes from recommended dose

Tetrabenazine	Phenotype	Genetic Test	Results	Source/Evidence Level
Austedo Nitoman Xenazine ReviewGx	Normal metabolizer	CYP2D6	*1/*1	FDA 1[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

- CYP2D6 alleles do not indicate changes from recommended dose

Thioguanine	Phenotype	Genetic Test	Results	Source/Evidence Level
Lanvis ReviewGx	Normal metabolizer	TPMT	*1/*1	CPIC A[39,44]; FDA 1[46]
	Normal metabolizer	NUDT15	*1/*1	CPIC A[39,44]; FDA 1[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

- CPIC – TPMT Implication: Lower concentrations of thioguanine nucleotides (TGN) metabolites, but note that TGN after thioguanine are 5-10X higher than TGN after mercaptopurine or azathioprine. Normal risk of thiopurine-related leukopenia, neutropenia, myelosuppression.
- CPIC – NUDT15 Implication: Normal risk of thiopurine-related leukopenia, neutropenia, myelosuppression.
- CPIC – Strong Recommendation: Start with normal starting dose (e.g., 40-60 mg/m2/day) and adjust doses of thioguanine and of other myelosuppressive therapy without any special emphasis on thioguanine. Allow 2 weeks to reach steady-state after each dose adjustment.
  Normal starting doses vary by race/ethnicity and treatment regimens.

Thioridazine	Phenotype	Genetic Test	Results	Source/Evidence Level
TreatGx ReviewGx	Normal metabolizer	CYP2D6	*1/*1	FDA 1[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 FDA PGx Table: No recommended changes or information for this CYP2D6 phenotype in the FDA PGx Table

Tolterodine	Phenotype	Genetic Test	Results	Source/Evidence Level
Detrol	Normal metabolizer	CYP2D6	*1/*1	FDA 2[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

TreatGx ReviewGx

1 CYP2D6 alleles do not indicate changes from recommended dose

Tramadol	Phenotype	Genetic Test	Results	Source/Evidence Level
Conzip Durela Ralivia Ultram Zytram XL	Normal metabolizer	CYP2D6	*1/*1	CPIC A[14]; FDA 1[46]; FDA 2[46]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CPIC – Implication: Expected O-desmethyltramadol (active metabolite) formation.

1 CPIC – Strong Recommendation: Use tramadol label recommended age specific or weight-specific dosing.

TreatGx ReviewGx

Trimipramine	Phenotype	Genetic Test	Results	Source/Evidence Level
Surmontil	Normal metabolizer	CYP2D6	*1/*1	CPIC B[24]; FDA 3[46]
ReviewGx	Rapid metabolizer	CYP2C19	*1/*17	CPIC B[24]

Drug-Gene Interactions:

Moderate drug-gene interaction: consider alternative medications, may reduce efficacy, may increase adverse events

2 CPIC – CYP2D6 Implication: Normal metabolism of TCAs.

2 CPIC – CYP2C19 Implication: Increased metabolism of tertiary amines compared to normal metabolizers. Greater conversion of tertiary amines to secondary amines may affect response or side effects.

2 CPIC – Optional Recommendation: Consider alternative drug not metabolized by CYP2C19. If use is warranted, utilize therapeutic drug monitoring to guide dose adjustment. TCAs without major CYP2C19 metabolism include the secondary amines nortriptyline and desipramine.
Recommendations above only apply to higher initial doses of TCAs for treatment of conditions such as depression. Lower dosages are often used for neuropathic pain compared to depressive disorders.
There are limited data to support dose recommendations for CYP2C19*17 carriers who are prescribed TCAs at lower doses for neuropathic pain treatment.

Valbenazine	Phenotype	Genetic Test	Results	Source/Evidence Level
Ingrezza	Normal metabolizer	CYP2D6	*1/*1	FDA 1[46]

Drug-Gene Interactions:

ReviewGx

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 CYP2D6 alleles do not indicate changes from recommended dose

Venlafaxine	Phenotype	Genetic Test	Results	Source/Evidence Level
Effexor XR	Normal metabolizer	CYP2D6	*1/*1	CPIC B[10]; FDA 1[46]

TreatGx
ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 Normal CYP2D6 metabolism

1 Initiate therapy with recommended starting dose (per CPIC strong recommendation).

Viloxazine	Phenotype	Genetic Test	Results	Source/Evidence Level
Qelbree	Normal metabolizer	CYP2D6	*1/*1	FDA 3[46]

ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 FDA PGx Table: No recommended changes or information for this phenotype in the FDA PGx Table

Voriconazole	Phenotype	Genetic Test	Results	Source/Evidence Level
Vfend	Rapid metabolizer	CYP2C19	*1/*17	CPIC A[33]; FDA 2[46]

ReviewGx

Drug-Gene Interactions:

Serious drug-gene interaction: avoid/select alternative

3 CPIC – Implication: In patients for whom a rapid metabolizer genotype (*1/*17) is identified, the probability of attainment of therapeutic concentrations is: (a) for ADULTS, modest with standard dosing, and (b) for PEDIATRICS <18yo, variable.

3 ADULTS: CPIC – Moderate Recommendation: Choose an alternative agent that is not dependent on CYP2C19 metabolism as primary therapy in lieu of voriconazole. Such agents include isavuconazole, liposomal amphotericin B, and posaconazole. Further dose adjustments or selection of alternative therapy may be necessary due to other clinical factors, such as drug interactions, hepatic function, renal function, species, site of infection, therapeutic drug monitoring, and comorbidities.

2 PEDIATRICS <18yo: CPIC – Moderate Recommendation: Initiate therapy with recommended standard of care dosing. Use therapeutic drug monitoring (TDM) to titrate dose to therapeutic trough concentrations. Achieving voriconazole therapeutic concentrations in the pediatric population with ultrarapid and rapid metabolizer phenotypes in a timely manner is difficult. As critical time may be lost in achieving therapeutic concentrations, an alternative antifungal agent is recommended in order that the child receives effective antifungal therapy as soon as possible. Meticulous TDM is critical for rapid metabolizers. There is insufficient evidence to distinguish a CYP2C19*1/*17 and *1/*1 pediatric patient due to large variability in trough concentrations.

Vortioxetine	Phenotype	Genetic Test	Results	Source/Evidence Level
Trintellix	Normal metabolizer	CYP2D6	*1/*1	CPIC A[10]; FDA 1[46]

TreatGx
ReviewGx

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 Normal CYP2D6 metabolism

1 Initiate therapy with recommended starting dose (per CPIC strong recommendation).

Warfarin	Phenotype	Genetic Test	Results	Source/Evidence Level
Coumadin Jantoven TreatGx ReviewGx	Normal metabolizer	CYP2C9	*1/*1	CPIC A[26]; FDA 1[46]
	Increased response	VKORC1 rs9923231	G/A	CPIC A[26]; FDA 1[46]
	Typical response	CYP4F2 rs2108622	C/C	CPIC A[26]; FDA 1[46]
	Typical response	CYP2C rs12777823	G/G	CPIC A[26]

Drug-Gene Interactions:

Moderate drug-gene interaction: may require a reduced dose, may require an increased dose, may reduce efficacy, may increase adverse events

2 CPIC – Strong Recommendation for Non-African ancestry/Moderate Recommendation for African ancestry: Calculate initial dose based on validated published pharmacogenetic algorithms, using results for VKORC1-1639G>A and CYP2C9 *2 and *3.
It is important to note that these algorithms do not include CYP4F2, CYP2C9*5, *6, *8 or *11, or rs12777823, and incorporation of these should be added when results are available.

The International Warfarin Pharmacogenetics Consortium (IWPC) dosing algorithm is available online at: https://files.cpicpgx.org/data/guideline/publication/warfarin/2011/IWPC_dose_calculator.xls

Another option http://warfarindosing.org/ contains Gage as the primary algorithm and IWPC as the secondary algorithm, and can adjust for CYP4F2, CYP2C9*5, and *6.

The two algorithms provide very similar dose recommendations. Most algorithms are developed for target INR 2-3.

The IWPC algorithm is available within the TreatGx software (see Atrial Fibrillation – Anticoagulation), accounting for all factors from the IWPC calculation (height, weight, age, VKORC1, CYP2C9*2 and *3, ethnicity/race, drug-drug interactions) along with additional optional adjustments for CYP2C9 *5, *6, *8, *11, CYP4F2 rs2108622, CYP2C rs12777823, smoking, and target INR other than 2-3.

An alternative is to use the FDA-approved Product Monograph, which provides expected maintenance dose ranges based on VKORC1 and CYP2C9 results.

CPIC – Optional Recommendation: For loading dose, a pharmacogenetics-based warfarin initiation dose algorithm could be considered. See the EU-PACT trial for pharmacogenetics-based warfarin initiation (loading) dose algorithm. https://www.nejm.org/doi/full/10.1056/NEJMoa1311386

Zuclopenthixol	Phenotype	Genetic Test	Results	Source/Evidence Level
Clopixol TreatGx ReviewGx	Normal metabolizer	CYP2D6	*1/*1	DPWG[17]

Drug-Gene Interactions:

Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

1 DPWG: no recommendation for this CYP2D6 phenotype.

Table of Available References

Drug	Genetic Test	Sources
Abacavir	HLA-B*57:01	CPIC[31]; FDA[46]
Abrocitinib	CYP2C19	FDA[36,46]
Allopurinol	HLA-B*58:01	CPIC[41]; FDA[46]
Amitriptyline	CYP2D6	CPIC[24]; FDA[46]
Amitriptyline	CYP2C19	CPIC[24]
Amoxapine	CYP2D6	FDA[46]
Amphetamine	CYP2D6	FDA[46]
Aripiprazole	CYP2D6	FDA[46]; Product monograph (actionable)[42]
Aripiprazole lauroxil	CYP2D6	FDA[46]; Product monograph (actionable)[2]
Atazanavir	UGT1A1	CPIC[19]
Atomoxetine	CYP2D6 (Activity Score)	CPIC[11]; FDA[46]
Atorvastatin	SLCO1B1	CPIC[13]; FDA[46]
Avatrombopag	CYP2C9	FDA[46]
Azathioprine	TPMT	CPIC[39,44]; FDA[46]
Azathioprine	NUDT15	CPIC[39,44]; FDA[46]
Brexpiprazole	CYP2D6	FDA[46]; Product monograph (actionable)[3]
Brivaracetam	CYP2C19	FDA[46]
Capecitabine	DPYD	CPIC[4]; FDA[46]
Carbamazepine	HLA-A*31:01	CPIC[38]; FDA[46]
Carbamazepine	HLA-B*15:02	CPIC[38]; FDA[46]
Carisoprodol	CYP2C19	FDA[46]
Carvedilol	CYP2D6	FDA[46]
Celecoxib	CYP2C9 (Star Alleles)	CPIC[45]; FDA[46]
Cevimeline	CYP2D6	FDA[46]
Citalopram	CYP2C19	CPIC[10]; FDA[46]
Clobazam	CYP2C19	FDA[46]; Product monograph (actionable)[30]
Clomipramine	CYP2D6	CPIC[24]; FDA[46]
Clomipramine	CYP2C19	CPIC[24]
Clopidogrel	CYP2C19	CPIC[28]; FDA[46]
Clozapine	CYP2D6	FDA[46]
Codeine	CYP2D6	CPIC[14]; FDA[46]
Cyclosporine	CYP3A5	PharmGKB[47,48]
Darifenacin	CYP2D6	FDA[46]
Desipramine	CYP2D6	CPIC[24]; FDA[46]
Deutetrabenazine	CYP2D6	FDA[46]
Dexlansoprazole	CYP2C19	CPIC[29]; FDA[46]
Dextromethorphan/ Bupropion	CYP2D6	FDA[6]
Dextromethorphan/ Quinidine	CYP2D6	FDA[5]
Diazepam	CYP2C19	FDA[46]
Donepezil	CYP2D6	FDA[46]
Doxepin	CYP2D6	CPIC[24]; FDA[46]

Drug	Genetic Test	Sources
Doxepin	CYP2C19	CPIC[24]; FDA[46]
Dronabinol	CYP2C9	FDA[46]
Efavirenz	CYP2B6	CPIC[15]; FDA[46]
Elagolix	SLCO1B1	FDA[46]
Eliglustat	CYP2D6	DPWG[17]; FDA[46]
Erdafitinib	CYP2C9 (Star Alleles)	FDA[46]
Escitalopram	CYP2C19	CPIC[10]; FDA[46]
Esomeprazole	CYP2C19	FDA[46]
Fesoterodine	CYP2D6	FDA[46]
Flecainide	CYP2D6	DPWG[17]
Flibanserin	CYP2C19	FDA[46]
Fluorouracil	DPYD	CPIC[4]; FDA[46]
Fluoxetine	CYP2D6	Product monograph (actionable)[12]
Flurbiprofen	CYP2C9 (Star Alleles)	CPIC[45]; FDA[46]
Fluvastatin	CYP2C9	CPIC[13]
Fluvastatin	SLCO1B1	CPIC[13]
Fluvoxamine	CYP2D6	CPIC[10]; FDA[46]
Fosphenytoin	HLA-B*15:02	CPIC[27]; FDA[46]
Fosphenytoin	CYP2C9	CPIC[27]; FDA[46]
Galantamine	CYP2D6	FDA[46]
Gefitinib	CYP2D6	FDA[46]
Haloperidol	CYP2D6	DPWG[17]
Hydrocodone	CYP2D6	CPIC[14]
Ibuprofen	CYP2C9 (Star Alleles)	CPIC[45]; FDA[46]
Iloperidone	CYP2D6	FDA[46]
Imipramine	CYP2D6	CPIC[24]; FDA[46]
Imipramine	CYP2C19	CPIC[24]
Irinotecan	UGT1A1	DPWG[17]; FDA[25,37,46]
Lamotrigine	HLA-B*15:02	DPWG[17]
Lamotrigine	HLA-B*58:01	PharmGKB[47,48]
Lansoprazole	CYP2C19	CPIC[29]; FDA[46]
Lofexidine	CYP2D6	FDA[46]
Lovastatin	SLCO1B1	CPIC[13]
Mavacamten	CYP2C19	FDA[46]
Meclizine	CYP2D6	FDA[46]
Meloxicam	CYP2C9 (Star Alleles)	CPIC[45]; FDA[46]
Mercaptopurine	TPMT	CPIC[39,44]; FDA[46]
Mercaptopurine	NUDT15	CPIC[39,44]; FDA[46]
Methadone	CYP2B6	CPIC[40]; PharmGKB[47,48]
Metoclopramide	CYP2D6	FDA[46]
Metoprolol	CYP2D6	CPIC[16]
Mirabegron	CYP2D6	FDA[46]
Mirtazapine	CYP2D6	DPWG[17]; PharmGKB 2A[47,48]
Nateglinide	CYP2C9	FDA[46]
Nebivolol	CYP2D6	FDA[46]
Nevirapine	CYP2B6 rs28399499	PharmGKB[47,48]
Nevirapine	CYP2B6 rs3745274	PharmGKB[47,48]

Drug	Genetic Test	Sources
Nortriptyline	CYP2D6	CPIC[24]; FDA[46]
Oliceridine	CYP2D6	FDA[46]
Omeprazole	CYP2C19	CPIC[29]; FDA[46]
Ondansetron	CYP2D6	CPIC[7]
Oxcarbazepine	HLA-B*15:02	CPIC[38]; FDA[46]
Oxycodone	CYP2D6	CPIC[14]; PharmGKB[47,48]
Pantoprazole	CYP2C19	CPIC[29]; FDA[46]
Paroxetine	CYP2D6	CPIC[10]; FDA[46]
Pazopanib	HLA-B*57:01	FDA[46]
Perphenazine	CYP2D6	FDA[46]
Phenytoin	HLA-B*15:02	CPIC[27]; FDA[46]
Phenytoin	CYP2C9	CPIC[27]; FDA[46]
Pimozide	CYP2D6	FDA[46]
Piroxicam	CYP2C9 (Star Alleles)	CPIC[45]; FDA[46]
Pitavastatin	SLCO1B1	CPIC[13]
Pitolisant	CYP2D6	FDA[46]; Product monograph (actionable)[23]
Pravastatin	SLCO1B1	CPIC[13]
Propafenone	CYP2D6	DPWG[17]; FDA[46]
Propranolol	CYP2D6	FDA[46]
Protriptyline	CYP2D6	FDA[46]
Quetiapine	CYP3A4	DPWG[17]
Rabeprazole	CYP2C19	FDA[46]
Risperidone	CYP2D6	DPWG[17]; FDA[46]
Rosuvastatin	SLCO1B1	CPIC[13]; FDA[46]
Sertraline	CYP2B6	CPIC[10]
Sertraline	CYP2C19	CPIC[10]
Simvastatin	SLCO1B1	CPIC[13]; FDA[46]
Siponimod	CYP2C9 (Star Alleles)	FDA[46]
Tacrolimus	CYP3A5	CPIC[9]; FDA[46]
Tacrolimus	CYP3A4	PharmGKB[47,48]
Tamoxifen	CYP2D6 (Activity Score)	CPIC[21]; FDA[46]
Tamsulosin	CYP2D6	FDA[46]
Tenoxicam	CYP2C9 (Star Alleles)	CPIC[45]
Tetrabenazine	CYP2D6	FDA[46]
Thioguanine	TPMT	CPIC[39,44]; FDA[46]
Thioguanine	NUDT15	CPIC[39,44]; FDA[46]
Thioridazine	CYP2D6	FDA[46]
Tolterodine	CYP2D6	FDA[46]
Tramadol	CYP2D6	CPIC[14]; FDA[46]
Trimipramine	CYP2D6	CPIC[24]; FDA[46]
Trimipramine	CYP2C19	CPIC[24]
Valbenazine	CYP2D6	FDA[46]
Venlafaxine	CYP2D6	CPIC[10]; FDA[46]
Viloxazine	CYP2D6	FDA[46]
Voriconazole	CYP2C19	CPIC[33]; FDA[46]
Vortioxetine	CYP2D6	CPIC[10]; FDA[46]

Drug	Genetic Test	Sources
Warfarin	CYP2C9	CPIC[26]; FDA[46]
Warfarin	VKORC1 rs9923231	CPIC[26]; FDA[46]
Warfarin	CYP4F2 rs2108622	CPIC[26]; FDA[46]
Warfarin	CYP2C rs12777823	CPIC[26]
Zuclopenthixol	CYP2D6	DPWG[17]

References

https://www.genxys.com/lab-references

Methods

Pharmacogenetic analysis was performed using the Agena Bioscience MassARRAY® system, a targeted genotyping platform that combines multiplex PCR amplification with MALDI-TOF mass spectrometry to detect clinically relevant DNA variants with high accuracy. In this method, genomic DNA undergoes end-point multiplex PCR, followed by shrimp alkaline phosphatase (SAP) cleanup and a single-base extension reaction, enabling precise characterization of selected SNPs, insertions, deletions, and copy number variations relevant to pharmacogenetic gene pathways. After extension, reaction products are dispensed onto a SpectroCHIP® array and analyzed by MALDI-TOF mass spectrometry, which distinguishes alleles based on their mass-to-charge ratio. The accuracy and concordance of every run is controlled with internal positive and negative controls. Preceding the MassARRAY® run, DNA is extracted with magnetic bead-based chemagic 360 system (Revvity).

Limitations

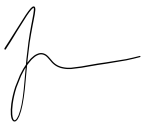
The annotations and interpretations provided in this report are based on scientific literature and do not take into account drug-drug interactions, medical conditions or other clinical factors that may affect medication response. Gene-drug interactions are ranked according to guidelines, level of evidence and clinical utility. GenXys reports and TreatGx Clinical Decision Support are regularly updated. 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 GenXys Health Care Systems. 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.

Laboratory Director



Dr Juha Matilainen, PhD, Laboratory Director

21/Apr/2026

Date of Signature

Laboratory Report

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

Gene	rsID	Allele Information	Allele Information Reference	Result
2C Cluster	rs12777823	g.94645745G>A	NC_000010.11	G/G
CYP2B6	rs3745274	c.516G>A/T	NM_000767.5	G/G
CYP2B6	rs2279343	c.785A>G	NM_000767.5	A/A
CYP2B6	rs28399499	c.983T>C	NM_000767.5	T/T
CYP2C19	rs72558186	g.19294T>A	NM_000769.1	T/T
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	rs56337013	c.1297C>T	NM_000769.4	C/C
CYP2C19	rs12769205	c.332-23A>G	NM_000769.4	A/A
CYP2C9	rs1057910	c.1075A>C	NM_000771.3	A/A
CYP2C9	rs1799853	c.430C>T	NM_000771.3	C/C
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	rs56165452_ASO	c.1076T>C	NM_000771.3	Unreported
CYP2C9	rs7900194	c.449G>A/C/T	NM_000771.4	G/G
CYP2C9	rs72558190	c.485C>A	NM_000771.3	C/C
CYP2C9	rs72558187	c.269T>C	NM_000771.4	T/T
CYP2C9	rs9332239	c.1465C>T	NM_000771.4	C/C
CYP2D6	rs765776661	c.1403_1411dup	NM_000106.6	D/D
CYP2D6	rs774671100	c.137dup	NM_000106.6	A/A
CYP2D6	rs72549353	c.765_768del	NM_000106.6	A/A
CYP2D6	rs79292917	c.975G>A	NM_000106.6	C/C
CYP2D6	rs72549352	c.805dup	NM_000106.6	C/C
CYP2D6	rs72549346	c.1088_1089dup	NM_000106.6	C/C
CYP2D6	rs5030862	c.124G>A	NM_000106.6	C/C
CYP2D6	rs5030656	c.841_843del	NM_000106.6	T/T
CYP2D6	rs35742686	c.775de	NM_000106.6	A/A
CYP2D6	rs201377835	c.181-1G>C	NM_000106.6	C/C
CYP2D6	rs1065852	c.100C>T	NM_000106.5	C/C
CYP2D6	rs16947	c.886C>T	NM_000106.5	C/C
CYP2D6	rs28371706	c.320C>A	NM_000106.5	C/C
CYP2D6	rs28371725	c.985+39G>A	NM_000106.5	G/G
CYP2D6	rs3892097	c.506-1G>A	NM_000106.5	C/C
CYP2D6	rs5030655	c.454delT	NM_000106.5	T/T
CYP2D6	rs5030867	c.971A>C	NM_000106.5	A/A
CYP2D6	rs59421388	c.1012G>A	NM_000106.5	C/C
CYP2D6	rs5030865	c.505G>T,G>A	NM_000106.6	C/C
CYP2D6	rs1135840	c.1304G>C	NM_001025161.2	C/C
CYP2D6	rs267608297	c.782C>T	NM_000106.6	G/G
CYP2D6	rs72549356	c.514TTTCGCCCC[3]	NM_000106.6	A/A

Gene	rsID	Allele Information	Allele Information Reference	Result
CYP2D6	rs267608319	c.1319G>A	NM_000106.6	C/C
CYP2D6	rs72549347	c.1030C>T	NM_000106.6	C/C
CYP2D6	rs61736512	c.406G>A	NM_000106.6	G/G
CYP2D6	rs1135822	c.358T>A	NM_000106.6	A/A
CYP3A4	rs67666821	c.1461del	NM_017460.6	C/C
CYP3A4	rs35599367	c.522-191G>A	NC_000007.14	G/G
CYP3A5	rs10264272	c.624G>A	NM_000777.4	C/C
CYP3A5	rs776746	c.219-237G>A	NM_000777.4	C/C
CYP3A5	rs41303343	c.1035dup	NC_000007.14	D/D
CYP4F2	rs2108622	c.1297G>A	NM_001082.5	C/C
DPYD	rs3918290	g.97450058C>T	NC_000001.11	C/C
DPYD	rs55886062	c.1679T>G/A	NC_000001.11	A/A
DPYD	rs67376798	c.2846A>T	NM_000110.4	T/T
DPYD	rs75017182	c.1129-5923C>G	NM_000110.4	G/G
DPYD	rs56038477	c.1236G>A	NM_000110.4	C/C
DPYD	rs115232898	c.557A>G	NM_000110.4	T/T
DPYD	rs72549303	c.1898del	NM_000110.4	G/G
DPYD	rs72549303_ASO	c.1898del	NM_000110.4	Unreported
HLA-A	A1			T/T
HLA-A	A2			T/T
HLA-B	B1			Unreported
HLA-B	B2			Unreported
HLA-B	B3			Unreported
NUDT15	rs777311140	c.80_81insCGGG	NM_018283.1	G/G
NUDT15	rs746071566_DEL	c.50_55dup	NC_000013.10	G/G
NUDT15	rs746071566_DUP	c.50_55dup	NC_000013.10	T/T
NUDT15	rs147390019	c.416G>A	NM_018283.1	G/G
NUDT15	rs116855232	c.415C>T	NM_018283.1	C/C
SLCO1B1	rs4149056	c.521T>C	NM_006446.4	C/T
TPMT	rs1800584	g.29363G>A	NG_012137.3	C/C
TPMT	rs759836180	c.95dup	NM_000367.3	D/D
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
TPMT	rs72552738	c.395G>A	NM_000367.3	C/C
TPMT	rs267607275	c.2T>C	NM_000367.3	A/A
UGT1A1	rs4148323	g.233760498G>A	NC_000002.12	G/G
VKORC1	rs9923231	g.31096368C>T	NC_000016.10	G/A (C/T)[1]
VKORC1	rs72547529	c.196G>A	NC_000016.10	C/C
VKORC1	rs61742245	c.106G>T/A	NC_000016.10	C/C

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.

Summary of Genetic and Phenotype Data

HLA

Gene	Allele	Result
HLA-A	*31:01	Positive
HLA-B	*15:02	Negative
HLA-B	*58:01	Negative
HLA-B	*57:01	Negative

Copy Number Variation

Gene	Reference	Result (Copy/Copies)
CYP2D6	NG_008376.3 exon 9	2N

Phenotype Table

Gene	Genotype Result	Activity Score	Phenotype Result OR Genotype Explanation
CYP2B6	*1/*1	N/A	Normal Metabolizer
CYP2C (rs12777823)	G/G	N/A	Typical response to warfarin (no change in PGx-related dose requirement)
CYP2C19	*1/*17	N/A	Rapid Metabolizer
CYP2C9	*1/*1	2	Normal Metabolizer
CYP2D6	*1/*1	2	Normal Metabolizer
CYP3A4	*1/*1	N/A	Normal Metabolizer
CYP3A5	*3/*3	N/A	Poor Metabolizer
CYP4F2 (rs2108622)	C/C	N/A	Typical response to warfarin (no change in PGx-related dose requirement)
DPYD	WT/WT	2	Normal Metabolizer
NUDT15	*1/*1	N/A	Normal Metabolizer
SLCO1B1	*1/*5	N/A	Decreased Function
TPMT	*1/*1	N/A	Normal Metabolizer
UGT1A1	*1/*1	N/A	Normal Metabolizer
VKORC1 (rs9923231)	A/G	N/A	Medium warfarin sensitivity (moderately reduced PGx-related dose requirement)