Gene2Rx

Pharmacogenetics Report

Report Information

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About This Report

This report contains pharmacogenetic alleles and implications for drug response for the genetic data submitted. Both the genotypes presented and implicated medications are predictions based on the submitted data and published pharmacogenetics literature. This is not a clinical report and the data contained here in no way should be used as clinical guidance.

The information presented in this report is based on allele mappings and therapeutic implications developed by the Clinical Pharmacogenomics Implementation Consortium (CPIC®) and the US Food and Drug administration (FDA). Gene2Rx is not affiliated with CPIC or the FDA in any way. The contents of this page have not been endorsed by CPIC or the FDA and are the sole responsibility of Gene2Rx.

This report includes information about how your pharmacogenetics may influence your response to the medications assessed in this report. Coverage depends on your data and report tier. A medication missing from this report may still have guidance from a clinical guideline or product label.

The implications of taking medication for which you may have an atypical response are based on probabilities. You may or may not experience any side effects or altered efficaciousness. Consult your healthcare provider before making any changes to your healthcare.

The quality of uploaded data is not verified and may contain errors that result in alterations to your pharmacogenetic report. Genotyping panels (such as those used by direct to consumer genetics services) offer an incomplete representation of an individual's genetics. You may harbor additional genetic variation that can affect drug response.

⚠ **Disclaimer:** Do not alter your medication dose or stop your medication without first consulting your healthcare provider.

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Pharmacogenetics Summary

This table contains the specific variants identified in each of the genes assessed for your Gene2Rx report. Evidence and actionability differ by gene and medication.

A few genes (including CYP2D6, CYP2C9, and DPYD) get a number called an *activity score* instead of a single category. The score is the sum of the activity values of your two gene copies, and a higher number means more enzyme activity. Dosing guidelines for these genes are often based on the score, so we show it next to the phenotype when it applies.

	GENE	GENOTYPE	PHENOTYPE
●	**ABCG2**	rs2231142G/rs2231142G	Normal Function
●	**ADH1B**	rs1229984C/rs1229984C	Normal Function
●	**AKT1**	rs2494732T/rs2494732T	Normal Function
●	**ALDH2**	rs671G/rs671G	Normal Function
●	**BCHE**	Reference/Reference	Normal Metabolizer
?	**CACNA1S**	Reference/Reference	No known risk variants found
●	**CHRNA5**	rs16969968G/rs16969968G	Normal Function
↓	**COMT**	rs4680A/rs4680A	Decreased Function
●	**CYP1A2**	*1/*1	Normal Metabolizer
↓	**CYP2A6**	*1/*17	Intermediate Metabolizer
?	**CYP2B6**	*18+Unknown/*9	Indeterminate
↓	**CYP2C19**	*1/*2	Intermediate Metabolizer
↓	**CYP2C9**	*1/*8	Intermediate Metabolizer (Activity Score 1.5)
↑	**CYP2D6**	*2/*2x2	Ultrarapid Metabolizer (Activity Score 3.0)
?	**CYP3A4**	*1/*15	Indeterminate
↓	**CYP3A5**	*1/*6	Intermediate Metabolizer
?	**CYP4F2**	*1/*2	Indeterminate
●	**DPYD**	Reference/Reference	Normal Metabolizer (Activity Score 2.0)
↓	**FAAH**	rs324420A/rs324420A	Decreased Function
●	**GIPR**	rs1800437G/rs1800437G	Normal Function
●	**GLP1R**	rs10305420C/rs10305420C	Typical Response
✕	**IFNL3**	rs12979860C/rs12979860T	Unfavorable Response Genotype
↓	**NAT2**	*4/*5	Intermediate Metabolizer
●	**NUDT15**	*1/*1	Normal Metabolizer
?	**RYR1**	Reference/Reference	No known risk variants found
↓	**SLCO1B1**	*31/*37	Decreased Function
↓	**SULT1A1**	*1/*2	Decreased Function
●	**TPMT**	*1/*1	Normal Metabolizer
●	**UGT1A1**	*1/*60	Normal Metabolizer
●	**VKORC1**	-1639G/-1639G	Normal Expression

PHENOTYPE SYMBOLS

Each symbol represents the predicted function of the gene. A non-normal allele does not necessarily lead to a change in drug response.

- ● Normal function
- ↓ Decreased function
- ↑ Increased function
- ✕ Severely decreased function or high-risk finding
- ? Unknown function

Pharmacogenetic Results

Drugs are grouped by clinical class. For each class with three or more drugs in your report, a scoreboard summarizes which medications you are likely to use as directed, which warrant caution, and which you may want to discuss alternatives for. The detailed tables below each scoreboard show the underlying gene-drug findings.

Therapeutic Guidance Legend

- Use as directed
- Use with caution / dose adjustment
- Consider alternative

Antidepressants

14 drugs

USE AS DIRECTED 2

- Fluvoxamine — CYP2D6
- Venlafaxine — CYP2D6

USE WITH CAUTION 3

- Citalopram — CYP2C19
- Escitalopram — CYP2C19
- Sertraline — CYP2B6, CYP2C19

CONSIDER ALTERNATIVE 9

- Amitriptyline — CYP2C19, CYP2D6
- Clomipramine — CYP2C19, CYP2D6
- Desipramine — CYP2D6
- Doxepin — CYP2C19, CYP2D6
- Imipramine — CYP2C19, CYP2D6
- Nortriptyline — CYP2D6
- Paroxetine — CYP2D6
- Trimipramine — CYP2C19, CYP2D6
- Vortioxetine — CYP2D6

Each card shows the gene driving the recommendation. Use as directed = your genetics suggest a typical response. Use with caution = consider dose adjustment or monitoring. Consider alternative = guidelines suggest discussing a different drug with your provider.

Antidepressants - SNRI

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
✓	Venlafaxine	Effexor XR	CYP2D6	Ultrarapid Metabolizer	**CPIC**: *Implication:* Increased metabolism of venlafaxine to the active metabolite O-desmethylvenlafaxine (desvenlafaxine) and increased O-desmethylvenlafaxine:venlafaxine ratio compared with normal metabolizers. There is insufficient evidence supporting the clinical impact of this increased ratio. *Therapeutic recommendation:* No action recommended based on genotype for venlafaxine because of minimal evidence regarding the impact on efficacy or side effects. **FDA**: No FDA guidance for your genotype	CPIC, FDA

Antidepressants - SSRI

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
⚠	Citalopram	Celexa	CYP2C19	Intermediate Metabolizer	**CPIC**: *Implication:* Reduced metabolism when compared with CYP2C19 normal metabolizers. Higher plasma concentrations may increase the probability of side effects. *Therapeutic recommendation:* Initiate therapy with recommended starting dose. Consider a slower titration schedule and lower maintenance dose than normal metabolizers. **FDA**: No FDA guidance for your genotype	CPIC, FDA
⚠	Escitalopram	Lexapro	CYP2C19	Intermediate Metabolizer	*Implication:* Reduced metabolism when compared with CYP2C19 normal metabolizers. Higher plasma concentrations may increase the probability of side effects. *Therapeutic recommendation:* Initiate therapy with recommended starting dose. Consider a slower titration schedule and lower maintenance dose than normal metabolizers.	CPIC
✓	Fluvoxamine	Luvox	CYP2D6	Ultrarapid Metabolizer	*Implication:* No data available for CYP2D6 ultrarapid metabolizers. *Therapeutic recommendation:* No recommendation due to lack of evidence.	CPIC
⚠	Paroxetine	Paxil, Seroxat	CYP2D6	Ultrarapid Metabolizer	*Implication:* Increased metabolism of paroxetine to less active compounds compared with CYP2D6 normal metabolizers. Lower plasma concentrations decrease the probability of clinical benefit. *Therapeutic recommendation:* Select alternative drug not predominantly metabolized by CYP2D6.	CPIC
?	Sertraline	Zoloft	CYP2C19	Intermediate Metabolizer	A combined CYP2C19 + CYP2B6 recommendation could not be given because one of the two genes was not called or has an indeterminate result. See the per-gene detail below.	CPIC
			CYP2B6	Indeterminate		
?	Sertraline	Zoloft	CYP2B6	Indeterminate	*Implication:* No CPIC guidance for this phenotype. *Therapeutic recommendation:* A genotype-based dosing recommendation cannot be determined from this result.	CPIC
⚠	Sertraline	Zoloft	CYP2C19	Intermediate Metabolizer	*Implication:* Reduced metabolism of sertraline to less active compounds when compared with CYP2C19 normal metabolizers. *Therapeutic recommendation:* Initiate therapy with recommended starting dose. Consider a slower titration schedule and lower maintenance dose than CYP2C19 normal metabolizers.	CPIC
⚠	Vortioxetine	Trintellix, Brintellix	CYP2D6	Ultrarapid Metabolizer	**CPIC**: *Implication:* Increased metabolism of vortioxetine to inactive compounds compared with normal metabolizers. Lower plasma concentrations decrease the probability of clinical benefit. *Therapeutic recommendation:* Select alternative drug not predominantly metabolized by CYP2D6. If vortioxetine use is warranted, initiate therapy at standard starting dose and titrate to maintenance dose based on efficacy and side effects. Increasing the target maintenance dose by 50% or more may be needed for efficacy. **FDA**: No FDA guidance for your genotype	CPIC, FDA

Antidepressants - TCA

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
⚠	Amitriptyline	Elavil	CYP2D6	Ultrarapid Metabolizer (Activity Score 3.0)	*Combined implication:* CYP2D6: Increased metabolism of TCAs to less active compounds compared to normal metabolizers; Lower plasma concentrations of active drug will increase probability of pharmacotherapy failure CYP2C19: Reduced metabolism of tertiary amines compared to normal metabolizers *Recommendation:* Avoid amitriptyline use; If amitriptyline is warranted, utilize therapeutic drug monitoring to guide dose adjustment. Utilizing therapeutic drug monitoring to guide dose adjustments is strongly recommended. Evidence strength: Optional From the combined CYP2D6 and CYP2C19 table in CPIC's guideline for tricyclic antidepressants. CYP2D6 is matched on its activity score.	CPIC
			CYP2C19	Intermediate Metabolizer		
⚠	Clomipramine	Anafranil	CYP2D6	Ultrarapid Metabolizer (Activity Score 3.0)	*Combined implication:* CYP2D6: Increased metabolism of TCAs to less active compounds compared to normal metabolizers; Lower plasma concentrations of active drug will increase probability of pharmacotherapy failure CYP2C19: Reduced metabolism of tertiary amines compared to normal metabolizers *Recommendation:* Avoid clomipramine use; If clomipramine is warranted, utilize therapeutic drug monitoring to guide dose adjustment. Utilizing therapeutic drug monitoring to guide dose adjustments is strongly recommended. Evidence strength: Optional From the combined CYP2D6 and CYP2C19 table in CPIC's guideline for tricyclic antidepressants. CYP2D6 is matched on its activity score.	CPIC
			CYP2C19	Intermediate Metabolizer		

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
⚠	Desipramine	Norpramin	CYP2D6	Ultrarapid Metabolizer	*Implication:* Increased metabolism of TCAs to less active compounds compared to normal metabolizers. Lower plasma concentrations of active drug will increase probability of pharmacotherapy failure. *Therapeutic recommendation:* Avoid tricyclic use due to potential lack of efficacy. Consider alternative drug not metabolized by CYP2D6. If a TCA is warranted, consider titrating to a higher target dose (compared to normal metabolizers). Utilize therapeutic drug monitoring to guide dose adjustments.	CPIC
⚠	Doxepin	Sinequan, Quitaxon, Aponal	CYP2D6 CYP2C19	Ultrarapid Metabolizer (Activity Score 3.0) Intermediate Metabolizer	*Combined implication:* CYP2D6: Increased metabolism of TCAs to less active compounds compared to normal metabolizers; Lower plasma concentrations of active drug will increase probability of pharmacotherapy failure CYP2C19: Reduced metabolism of tertiary amines compared to normal metabolizers *Recommendation:* Avoid doxepin use; If doxepin is warranted, utilize therapeutic drug monitoring to guide dose adjustment. Utilizing therapeutic drug monitoring to guide dose adjustments is strongly recommended. Evidence strength: Optional From the combined CYP2D6 and CYP2C19 table in CPIC's guideline for tricyclic antidepressants. CYP2D6 is matched on its activity score.	CPIC
⚠	Imipramine	Tofranil	CYP2D6 CYP2C19	Ultrarapid Metabolizer (Activity Score 3.0) Intermediate Metabolizer	*Combined implication:* CYP2D6: Increased metabolism of TCAs to less active compounds compared to normal metabolizers; Lower plasma concentrations of active drug will increase probability of pharmacotherapy failure CYP2C19: Reduced metabolism of tertiary amines compared to normal metabolizers *Recommendation:* Avoid imipramine use; If imipramine is warranted, utilize therapeutic drug monitoring to guide dose adjustment. Utilizing therapeutic drug monitoring to guide dose adjustments is strongly recommended. Evidence strength: Optional From the combined CYP2D6 and CYP2C19 table in CPIC's guideline for tricyclic antidepressants. CYP2D6 is matched on its activity score.	CPIC
⚠	Nortriptyline	Pamelor	CYP2D6	Ultrarapid Metabolizer	*Implication:* Increased metabolism of TCAs to less active compounds compared to normal metabolizers. Lower plasma concentrations of active drug will increase probability of pharmacotherapy failure. *Therapeutic recommendation:* Avoid tricyclic use due to potential lack of efficacy. Consider alternative drug not metabolized by CYP2D6. If a TCA is warranted, consider titrating to a higher target dose (compared to normal metabolizers). Utilize therapeutic drug monitoring to guide dose adjustments.	CPIC
⚠	Trimipramine	Surmontil	CYP2D6 CYP2C19	Ultrarapid Metabolizer (Activity Score 3.0) Intermediate Metabolizer	*Combined implication:* CYP2D6: Increased metabolism of TCAs to less active compounds compared to normal metabolizers; Lower plasma concentrations of active drug will increase probability of pharmacotherapy failure CYP2C19: Reduced metabolism of tertiary amines compared to normal metabolizers *Recommendation:* Avoid trimipramine use; If trimipramine is warranted, utilize therapeutic drug monitoring to guide dose adjustment. Utilizing therapeutic drug monitoring to guide dose adjustments is strongly recommended. Evidence strength: Optional From the combined CYP2D6 and CYP2C19 table in CPIC's guideline for tricyclic antidepressants. CYP2D6 is matched on its activity score.	CPIC

Antipsychotics

12 drugs

USE AS DIRECTED 8	USE WITH CAUTION 3	CONSIDER ALTERNATIVE 0	INFORMATIONAL / UNABLE TO DETERMINE 1
Aripiprazole CYP2D6	Haloperidol CYP2D6	*No drugs in this category.*	Quetiapine CYP3A4
Aripiprazole Lauroxil CYP2D6	Risperidone CYP2D6		
Brexpiprazole CYP2D6	Zuclopenthixol CYP2D6		
Clozapine CYP2D6			
Iloperidone CYP2D6			
Perphenazine CYP2D6			
Pimozide CYP2D6			
Thioridazine CYP2D6			

Each card shows the gene driving the recommendation. Use as directed = your genetics suggest a typical response. Use with caution = consider dose adjustment or monitoring. Consider alternative = guidelines suggest discussing a different drug with your provider.

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
✓	Aripiprazole Lauroxil	Aristada	CYP2D6	Ultrarapid Metabolizer	No FDA guidance for your genotype	FDA
✓	Aripiprazole	Abilify	CYP2D6	Ultrarapid Metabolizer	**DPWG**: Increased CYP2D6 activity lowers the combined blood level of aripiprazole and its active metabolite dehydroaripiprazole to a limited degree. There is no evidence that this reduces effectiveness. **FDA**: No FDA guidance for your genotype	DPWG, FDA
✓	Brexpiprazole	Rexulti	CYP2D6	Ultrarapid Metabolizer	**DPWG**: Increased CYP2D6 activity lowers exposure to brexpiprazole, but there are no indications that this reduces effectiveness. **FDA**: No FDA guidance for your genotype	DPWG, FDA
✓	Clozapine	Clozaril	CYP2D6	Ultrarapid Metabolizer	**DPWG**: CYP2D6 variation can change clozapine blood levels, but this has no clinical consequences. **FDA**: No FDA guidance for this phenotype	DPWG, FDA
⚠	Haloperidol	Haldol	CYP2D6	Ultrarapid Metabolizer	Increased CYP2D6 activity leads to accelerated conversion of haloperidol. Plasma concentration is approximately 40% lower than in Normal Metabolizers, risking reduced effectiveness.	DPWG
✓	Iloperidone	Fanapt	CYP2D6	Ultrarapid Metabolizer	No FDA guidance for your genotype	FDA
✓	Perphenazine	Trilafon	CYP2D6	Ultrarapid Metabolizer	No FDA guidance for your genotype	FDA
✓	Pimozide	Orap	CYP2D6	Ultrarapid Metabolizer	**DPWG**: Increased CYP2D6 activity can lower pimozide concentrations, but there is no evidence of reduced effectiveness. **FDA**: No FDA guidance for your genotype	DPWG, FDA
?	Quetiapine	Seroquel	CYP3A4	Indeterminate	CYP3A4 genotype could not be confidently determined.	DPWG
⚠	Risperidone	Risperdal	CYP2D6	Ultrarapid Metabolizer	Increased CYP2D6 activity raises the ratio of the active metabolite (9-hydroxyrisperidone, or paliperidone) to risperidone. The share of patients with therapy failure rises from 16% to 37%.	DPWG
✓	Thioridazine	Mellaril	CYP2D6	Ultrarapid Metabolizer	No FDA guidance for your genotype	FDA
⚠	Zuclopenthixol	Clopixol	CYP2D6	Ultrarapid Metabolizer	Increased CYP2D6 activity accelerates zuclopenthixol conversion, which can reduce plasma concentration and risk ineffectiveness.	DPWG

Psychostimulants

2 drugs

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
✓	Amphetamine	Adzenys ER	CYP2D6	Ultrarapid Metabolizer	No FDA guidance for your genotype	FDA
⚠	Atomoxetine	Strattera	CYP2D6	Ultrarapid Metabolizer	**CPIC**: *Implication:* Based on very limited data available for CYP2D6 ultrarapid metabolizers taking atomoxetine, it is unlikely ultrarapid metabolizers would achieve adequate serum concentrations for the intended effect at standard dosing. *Therapeutic 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. **FDA**: No FDA guidance for your genotype	CPIC, FDA

Movement disorders

3 drugs

USE AS DIRECTED 3	USE WITH CAUTION 0	CONSIDER ALTERNATIVE 0
Deutetrabenazine CYP2D6	*No drugs in this category.*	*No drugs in this category.*
Tetrabenazine CYP2D6		
Valbenazine CYP2D6		

Each card shows the gene driving the recommendation. Use as directed = your genetics suggest a typical response. Use with caution = consider dose adjustment or monitoring. Consider alternative = guidelines suggest discussing a different drug with your provider.

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
✓	Deutetrabenazine	Austedo	CYP2D6	Ultrarapid Metabolizer	No FDA guidance for your genotype	FDA
✓	Tetrabenazine	Xenazine	CYP2D6	Ultrarapid Metabolizer	No FDA guidance for your genotype	FDA
✓	Valbenazine	Ingrezza	CYP2D6	Ultrarapid Metabolizer	No FDA guidance for your genotype	FDA

Anticonvulsants

4 drugs

USE AS DIRECTED 0	USE WITH CAUTION 4	CONSIDER ALTERNATIVE 0
No drugs in this category.	Brivaracetam CYP2C19	*No drugs in this category.*
	Clobazam CYP2C19	
	Fosphenytoin CYP2C9	
	Phenytoin CYP2C9	

Each card shows the gene driving the recommendation. Use as directed = your genetics suggest a typical response. Use with caution = consider dose adjustment or monitoring. Consider alternative = guidelines suggest discussing a different drug with your provider.

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
⚠	Brivaracetam	Briviact	CYP2C19	Intermediate Metabolizer	Results in higher systemic concentrations and higher adverse reaction risk.	FDA
⚠	Clobazam	Onfi, Frisium	CYP2C19	Intermediate Metabolizer	Results in higher systemic active metabolite concentrations. Poor metabolism results in higher adverse reaction risk. Dosage adjustment is recommended. Refer to FDA labeling for specific dosing recommendations.	FDA
⚠	Fosphenytoin	Cerebyx	CYP2C9	Intermediate Metabolizer (Activity Score 1.5)	**CPIC**: *Implication:* Slightly reduced fosphenytoin metabolism; however, this does not appear to translate into increased side effects. *Therapeutic 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 SJS/TEN, and patients should be carefully monitored according to standard practice. **FDA**: May result in higher systemic concentrations and higher adverse reaction risk (central nervous system toxicity). Consider starting at the lower end of the dosage range and monitor serum concentrations. Refer to FDA labeling for specific dosing recommendations. Carriers of CYP2C9*3 alleles may be at increased risk of severe cutaneous adverse reactions. Consider avoiding fosphenytoin as an alternative to carbamazepine in patients who are CYP2C9*3 carriers. Genotyping is not a substitute for clinical vigilance and patient management.	CPIC, FDA
⚠	Phenytoin	Dilantin	CYP2C9	Intermediate Metabolizer (Activity Score 1.5)	**CPIC**: *Implication:* Slightly reduced phenytoin metabolism; however, this does not appear to translate into increased side effects. *Therapeutic 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 SJS/TEN, and patients should be carefully monitored according to standard practice. **FDA**: May result in higher systemic concentrations and higher adverse reaction risk (central nervous system toxicity). Refer to FDA labeling for specific dosing recommendations. Carriers of CYP2C9*3 alleles may be at increased risk of severe cutaneous adverse reactions. Consider avoiding phenytoin as an alternative to carbamazepine in patients who are CYP2C9*3 carriers. Genotyping is not a substitute for clinical vigilance and patient management.	CPIC, FDA

Pain management

13 drugs

USE AS DIRECTED 9

- Carisoprodol — CYP2C19
- Celecoxib — CYP2C9
- Flurbiprofen — CYP2C9
- Hydrocodone — CYP2D6
- Ibuprofen — CYP2C9
- Lornoxicam — CYP2C9
- Oliceridine — CYP2D6
- Pitolisant — CYP2D6
- Tenoxicam — CYP2C9

USE WITH CAUTION 2

- Meloxicam — CYP2C9
- Piroxicam — CYP2C9

CONSIDER ALTERNATIVE 2

- Codeine — CYP2D6
- Tramadol — CYP2D6

Each card shows the gene driving the recommendation. Use as directed = your genetics suggest a typical response. Use with caution = consider dose adjustment or monitoring. Consider alternative = guidelines suggest discussing a different drug with your provider.

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
✓	Carisoprodol	Soma	CYP2C19	Intermediate Metabolizer	No FDA guidance for this phenotype	FDA
✓	Celecoxib	Celebrex	CYP2C9	Intermediate Metabolizer (Activity Score 1.5)	**CPIC**: *Implication:* Mildly reduced metabolism *Therapeutic recommendation:* Initiate therapy with recommended starting dose. In accordance with the prescribing information, use the lowest effective dosage for the shortest duration consistent with individual patient treatment goals. **FDA**: No FDA guidance for your genotype	CPIC, FDA
⚠	Codeine	Tylenol 3	CYP2D6	Ultrarapid Metabolizer	**CPIC**: *Implication:* Increased formation of morphine leading to higher risk of toxicity *Therapeutic recommendation:* Avoid codeine use because of potential for serious toxicity. If opioid use is warranted, consider a non-tramadol opioid. **FDA**: Results in higher systemic active metabolite concentrations and higher adverse reaction risk (life-threatening respiratory depression and death). Codeine is contraindicated in children under 12 years of age.	CPIC, FDA
✓	Flurbiprofen	Ansaid, Ocufen, Strefen	CYP2C9	Intermediate Metabolizer (Activity Score 1.5)	**CPIC**: *Implication:* Mildly reduced metabolism *Therapeutic recommendation:* Initiate therapy with recommended starting dose. In accordance with the prescribing information, use the lowest effective dosage for the shortest duration consistent with individual patient treatment goals. **FDA**: No FDA guidance for your genotype	CPIC, FDA
✓	Hydrocodone	Hysingla ER	CYP2D6	Ultrarapid Metabolizer	*Implication:* Minimal evidence for pharmacokinetic or clinical effect. *Therapeutic recommendation:* No recommendation for hydrocodone therapy because of minimal evidence regarding adverse events or analgesia.	CPIC
✓	Ibuprofen	Advil	CYP2C9	Intermediate Metabolizer (Activity Score 1.5)	*Implication:* Mildly reduced metabolism *Therapeutic recommendation:* Initiate therapy with recommended starting dose. In accordance with the prescribing information, use the lowest effective dosage for the shortest duration consistent with individual patient treatment goals.	CPIC
✓	Lornoxicam	Xefo	CYP2C9	Intermediate Metabolizer (Activity Score 1.5)	*Implication:* Mildly reduced metabolism *Therapeutic recommendation:* Initiate therapy with recommended starting dose. In accordance with the prescribing information, use the lowest effective dosage for the shortest duration consistent with individual patient treatment goals.	CPIC
⚠	Meloxicam	Mobic	CYP2C9	Intermediate Metabolizer (Activity Score 1.5)	**CPIC**: *Implication:* Mildly reduced metabolism *Therapeutic recommendation:* Initiate therapy with recommended starting dose. In accordance with the meloxicam prescribing information, use the lowest effective dosage for the shortest duration consistent with individual patient treatment goals. **FDA**: No FDA guidance for this phenotype	CPIC, FDA
✓	Oliceridine	Olinvyk	CYP2D6	Ultrarapid Metabolizer	No FDA guidance for this phenotype	FDA
⚠	Piroxicam	Feldene	CYP2C9	Intermediate Metabolizer (Activity Score 1.5)	**CPIC**: *Implication:* Mildly reduced metabolism *Therapeutic recommendation:* Initiate therapy with recommended starting dose. In accordance with the prescribing information, use the lowest effective dosage for the shortest duration consistent with individual patient treatment goals. **FDA**: Results in higher systemic concentrations.	CPIC, FDA
✓	Pitolisant	Wakix	CYP2D6	Ultrarapid Metabolizer	No FDA guidance for this phenotype	FDA
✓	Tenoxicam	Mobiflex	CYP2C9	Intermediate Metabolizer (Activity Score 1.5)	*Implication:* Mildly reduced metabolism *Therapeutic recommendation:* Initiate therapy with recommended starting dose. In accordance with the prescribing information, use the lowest effective dosage for the shortest duration consistent with individual patient treatment goals.	CPIC
⚠	Tramadol	Ultram, ConZip	CYP2D6	Ultrarapid Metabolizer	**CPIC**: *Implication:* Increased formation of O-desmethyltramadol (active metabolite) leading to higher risk of toxicity *Therapeutic recommendation:* Avoid tramadol use because of potential for toxicity. If opioid use is warranted, consider a non-codeine opioid. **FDA**: Results in higher systemic and breast milk active metabolite concentrations, which may result in respiratory depression and death. Contraindicated in children under 12 and in adolescents following tonsillectomy/adenoidectomy. Breastfeeding is not recommended during treatment.	CPIC, FDA

Cardiovascular

7 drugs

USE AS DIRECTED 3	USE WITH CAUTION 3	CONSIDER ALTERNATIVE 1
Carvedilol CYP2D6	Hydralazine NAT2	Clopidogrel CYP2C19
Metoprolol CYP2D6	Mavacamten CYP2C19	
Propafenone CYP2D6	Warfarin CYP2C9, CYP4F2, VKORC1	

Each card shows the gene driving the recommendation. Use as directed = your genetics suggest a typical response. Use with caution = consider dose adjustment or monitoring. Consider alternative = guidelines suggest discussing a different drug with your provider.

Antiarrhythmics

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
✓	Propafenone	Rythmol SR	CYP2D6	Ultrarapid Metabolizer	No FDA guidance for your genotype	FDA

Antihypertensives

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
⚠	Hydralazine	Apresoline	NAT2	Intermediate Metabolizer	*Implication:* Predicted to have reduced plasma concentrations and efficacy of hydralazine compared to NAT2 poor metabolizers. *Therapeutic recommendation:* Consider a starting total daily dose of at least 75 mg. Titrate up to 300 mg total daily hydralazine dose as tolerated. NAT2 intermediate metabolizers typically require a 50-100% higher maintenance dose compared to poor metabolizers.	CPIC

Beta Blockers

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
✓	Carvedilol	Coreg, Coreg CR	CYP2D6	Ultrarapid Metabolizer	No FDA guidance for your genotype	FDA
✓	Metoprolol	Lopressor, Toprol XL	CYP2D6	Ultrarapid Metabolizer	*Implication:* Increased metabolism of metoprolol leading to decreased drug concentrations; however, it is unclear whether this results in clinically significant changes in heart rate, blood pressure, or clinical outcomes. *Therapeutic recommendation:* No recommendation for metoprolol therapy due to insufficient evidence regarding diminished metoprolol effectiveness clinically.	CPIC

Blood Thinners

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
⚠	Clopidogrel	Plavix	CYP2C19	Intermediate Metabolizer	**CPIC**: *Implication:* Reduced clopidogrel active metabolite formation; increased on-treatment platelet reactivity; increased risk for adverse cardiac and cerebrovascular events *Therapeutic recommendation:* Avoid standard dose (75 mg) clopidogrel if possible. Use prasugrel or ticagrelor at standard dose if no contraindication **FDA**: Results in lower systemic active metabolite concentrations, lower antiplatelet response, and may result in higher cardiovascular risk. Consider use of another platelet P2Y12 inhibitor.	CPIC, FDA
⚠	Warfarin	Coumadin	CYP2C9	Intermediate Metabolizer	**3.5-6 mg/day** (lower than typical starting dose). Based on your CYP2C9 (*1/*8) and VKORC1 (-1639G/-1639G) genotypes, your predicted stable warfarin dose is 3.5-6 mg/day (decreased ~15-30% for CYP2C9 *5/*6/*8/*11). This estimate is genotype-based only and does not account for age, weight, or interacting drugs. A clinician should confirm the starting dose using a validated pharmacogenetic dosing algorithm. Base genotype dose (CYP2C9 *1/*1, VKORC1 GG): 5-7 mg/day. Because you carry a CYP2C9 *5, *6, *8, or *11 reduced-function allele, your estimated dose is decreased by about 15-30%.	CPIC
			VKORC1	Normal expression		
			CYP4F2	Indeterminate		

Cardiomyopathy

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
⚠	Mavacamten	Camzyos	CYP2C19	Intermediate Metabolizer	Results in higher systemic concentrations and may have higher adverse reaction risk (heart failure). Dosage is based on individual response. The dose titration and monitoring schedule accounts for differences due to CYP2C19 genetic variation, so adjustments based on CYP2C19 genotype are not necessary. Refer to FDA labeling for specific dosing recommendations and monitoring.	FDA

Cholesterol medications

7 drugs

USE AS DIRECTED 1

- Rosuvastatin
  ABCG2, SLCO1B1

USE WITH CAUTION 5

- Atorvastatin
  SLCO1B1
- Fluvastatin
  CYP2C9, SLCO1B1
- Pitavastatin
  SLCO1B1
- Pravastatin
  SLCO1B1
- Simvastatin
  SLCO1B1

CONSIDER ALTERNATIVE 1

- Lovastatin
  SLCO1B1

Each card shows the gene driving the recommendation. Use as directed = your genetics suggest a typical response. Use with caution = consider dose adjustment or monitoring. Consider alternative = guidelines suggest discussing a different drug with your provider.

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
⚠	Atorvastatin	Lipitor	SLCO1B1	Decreased Function	*Implication:* Increased atorvastatin exposure as compared with normal function, which may translate to increased myopathy risk. *Therapeutic 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 the 40-mg dose. If dose >40 mg is needed for desired efficacy, consider combination therapy (i.e., atorvastatin plus nonstatin guideline-directed medical therapy).	CPIC
⚠	Fluvastatin	Lescol	CYP2C9	Intermediate Metabolizer (Activity Score 1.5)	*Combined implication:* CYP2C9: Increased fluvastatin exposure as compared to normal metabolizer which may translate to increased myopathy risk. SLCO1B1: Increased fluvastatin exposure as compared to normal function; Typical myopathy risk with ≤40 mg. *Recommendation:* Prescribe ≤20mg per day as a starting dose and adjust doses of fluvastatin based on disease-specific guidelines. If dose >20mg needed for desired efficacy, consider an alternative statin or combination therapy (i.e., fluvastatin plus non-statin guideline directed medical therapy) (PMID: 30423391). Evidence strength: Optional From the combined CYP2C9 and SLCO1B1 table in CPIC's statin guideline. CYP2C9 is matched on its activity score.	CPIC
			SLCO1B1	Decreased Function		
⚠	Lovastatin	Mevacor	SLCO1B1	Decreased Function	*Implication:* Increased lovastatin acid exposure as compared with normal function, which may translate to increased myopathy risk *Therapeutic recommendation:* Consider prescribing a lower-risk alternative such as atorvastatin (10 to 20 mg), pravastatin (40 mg), or rosuvastatin (5 to 10 mg). If lovastatin is warranted, limit the dose to ≤20 mg/day to reduce the risk of muscle-related side effects.	CPIC
⚠	Pitavastatin	Livalo	SLCO1B1	Decreased Function	*Implication:* Increased pitavastatin exposure as compared with normal function, which may translate to increased myopathy risk *Therapeutic recommendation:* Prescribe ≤2 mg as a starting dose and adjust doses of pitavastatin based on disease-specific guidelines. Be aware of possible increased risk for muscle-related side effects, especially for doses >1 mg. If dose >2 mg is needed for desired efficacy, consider switching to a lower-risk alternative such as atorvastatin (10 to 20 mg), pravastatin (40 mg), or rosuvastatin (5 to 10 mg), or using combination therapy (e.g., pitavastatin plus nonstatin guideline-directed medical therapy).	CPIC
⚠	Pravastatin	Pravachol	SLCO1B1	Decreased Function	*Implication:* Increased pravastatin exposure compared with normal function; typical myopathy risk with doses ≤40 mg *Therapeutic 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 especially with doses >40 mg per day.	CPIC
✓	Rosuvastatin	Crestor	ABCG2	Normal Function	*Combined implication:* ABCG2: Typical myopathy risk and rosuvastatin exposure SLCO1B1: Increased rosuvastatin exposure as compared to normal function; Typical myopathy risk with doses ≤20 mg. *Recommendation:* Prescribe desired starting dose and adjust doses of rosuvastatin based on disease-specific and specific population guidelines. Prescriber should be aware of possible increased risk for myopathy especially for doses >20mg. Evidence strength: Strong From the combined ABCG2 and SLCO1B1 table in CPIC's statin guideline.	CPIC
			SLCO1B1	Decreased Function		
⚠	Simvastatin	Zocor	SLCO1B1	Decreased Function	**CPIC**: *Implication:* Increased simvastatin acid exposure compared with normal function; increased risk of muscle side effects (myopathy) *Therapeutic recommendation:* Prescribe an alternative statin depending on desired potency. Low-risk options: atorvastatin 10 to 20 mg, pitavastatin 1 mg, pravastatin 40 mg, rosuvastatin 5 to 10 mg. Moderate-risk options: fluvastatin 80 mg, pitavastatin 2 mg, pravastatin 80 mg. High-risk options (use with caution): lovastatin 40 to 80 mg, pitavastatin 4 mg, simvastatin 20 to 40 mg. If simvastatin is used, limit dose to <20 mg/day. **FDA**: Results in higher systemic concentrations and higher adverse reaction risk (myopathy). The risk of adverse reaction (myopathy) is higher for patients on 80 mg than for those on lower doses.	CPIC, FDA

Antiemetics

4 drugs

USE AS DIRECTED 1	USE WITH CAUTION 1	CONSIDER ALTERNATIVE 2
Metoclopramide CYP2D6	Dronabinol CYP2C9	Ondansetron CYP2D6 Tropisetron CYP2D6

Each card shows the gene driving the recommendation. Use as directed = your genetics suggest a typical response. Use with caution = consider dose adjustment or monitoring. Consider alternative = guidelines suggest discussing a different drug with your provider.

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
⚠	Dronabinol	Syndros	CYP2C9	Intermediate Metabolizer	May result in higher systemic concentrations and higher adverse reaction risk. Monitor for adverse reactions.	FDA
✓	Metoclopramide	Reglan	CYP2D6	Ultrarapid Metabolizer	No FDA guidance for your genotype	FDA
⚠	Ondansetron	Zofran	CYP2D6	Ultrarapid Metabolizer	*Implication:* Increased metabolism to less active compounds when compared to normal metabolizers and is associated with decreased response to ondansetron and tropisetron (i.e. vomiting). *Therapeutic recommendation:* Select alternative drug not predominantly metabolized by CYP2D6 (i.e., granisetron).	CPIC
⚠	Tropisetron	Navoban	CYP2D6	Ultrarapid Metabolizer	*Implication:* Increased metabolism to less active compounds when compared to normal metabolizers and is associated with decreased response to ondansetron and tropisetron (i.e. vomiting). *Therapeutic recommendation:* Select alternative drug not predominantly metabolized by CYP2D6 (i.e., granisetron).	CPIC

Proton pump inhibitors

4 drugs

USE AS DIRECTED 0	USE WITH CAUTION 4	CONSIDER ALTERNATIVE 0
No drugs in this category.	Dexlansoprazole CYP2C19 Lansoprazole CYP2C19 Omeprazole CYP2C19 Pantoprazole CYP2C19	*No drugs in this category.*

Each card shows the gene driving the recommendation. Use as directed = your genetics suggest a typical response. Use with caution = consider dose adjustment or monitoring. Consider alternative = guidelines suggest discussing a different drug with your provider.

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
⚠	Dexlansoprazole	Dexilant	CYP2C19	Intermediate Metabolizer	*Implication:* Increased plasma concentration of PPI compared with CYP2C19 normal metabolizers; increased chance of efficacy and potentially toxicity *Therapeutic recommendation:* Initiate standard starting daily dose. For chronic therapy (>12 weeks) and efficacy achieved, consider 50% reduction in daily dose and monitor for continued efficacy.	CPIC
⚠	Lansoprazole	Prevacid	CYP2C19	Intermediate Metabolizer	*Implication:* Increased plasma concentration of PPI compared with CYP2C19 normal metabolizers; increased chance of efficacy and potentially toxicity *Therapeutic recommendation:* Initiate standard starting daily dose. For chronic therapy (>12 weeks) and efficacy achieved, consider 50% reduction in daily dose and monitor for continued efficacy.	CPIC
⚠	Omeprazole	Prilosec, Losec	CYP2C19	Intermediate Metabolizer	*Implication:* Increased plasma concentration of PPI compared with CYP2C19 normal metabolizers; increased chance of efficacy and potentially toxicity *Therapeutic recommendation:* Initiate standard starting daily dose. For chronic therapy (>12 weeks) and efficacy achieved, consider 50% reduction in daily dose and monitor for continued efficacy.	CPIC
⚠	Pantoprazole	Protonix	CYP2C19	Intermediate Metabolizer	**CPIC**: *Implication:* Increased plasma concentration of PPI compared with CYP2C19 normal metabolizers; increased chance of efficacy and potentially toxicity *Therapeutic recommendation:* Initiate standard starting daily dose. For chronic therapy (>12 weeks) and efficacy achieved, consider 50% reduction in daily dose and monitor for continued efficacy. **FDA**: No FDA guidance for your genotype	CPIC, FDA

Oncology

13 drugs

USE AS DIRECTED 13	USE WITH CAUTION 0	CONSIDER ALTERNATIVE 0
Belinostat UGT1A1	*No drugs in this category.*	*No drugs in this category.*
Belzutifan CYP2C19		
Capecitabine DPYD		
Erdafitinib CYP2C9		
Fluorouracil DPYD		
Gefitinib CYP2D6		
Irinotecan UGT1A1		
Mercaptopurine NUDT15, TPMT		
Nilotinib UGT1A1		
Pazopanib UGT1A1		
Sacituzumab Govitecan-Hziy UGT1A1		
Tamoxifen CYP2D6		
Thioguanine NUDT15, TPMT		

Each card shows the gene driving the recommendation. Use as directed = your genetics suggest a typical response. Use with caution = consider dose adjustment or monitoring. Consider alternative = guidelines suggest discussing a different drug with your provider.

Chemotherapies

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
✓	Belinostat	Beleodaq	UGT1A1	Normal Metabolizer	No FDA guidance for your genotype	FDA
✓	Belzutifan	Welireg	CYP2C19	Intermediate Metabolizer	No FDA guidance for this phenotype	FDA
✓	Capecitabine	Xeloda, Xitabin, Kapetral	DPYD	Normal Metabolizer (Activity Score 2.0)	**CPIC**: *Implication:* Normal DPD activity and "normal" risk for fluoropyrimidine toxicity *Therapeutic recommendation:* Based on genotype, there is no indication to change dose or therapy. Use label-recommended dosage and administration **FDA**: No FDA guidance for your genotype	CPIC, FDA
✓	Erdafitinib	Balversa	CYP2C9	Intermediate Metabolizer	No FDA guidance for your genotype	FDA
✓	Fluorouracil	Adrucil, Carac	DPYD	Normal Metabolizer (Activity Score 2.0)	**CPIC**: *Implication:* Normal DPD activity and "normal" risk for fluoropyrimidine toxicity *Therapeutic recommendation:* Based on genotype, there is no indication to change dose or therapy. Use label-recommended dosage and administration **FDA**: No FDA guidance for your genotype	CPIC, FDA
✓	Gefitinib	Iressa	CYP2D6	Ultrarapid Metabolizer	No FDA guidance for your genotype	FDA
✓	Irinotecan	Camptosar, Onivyde	UGT1A1	Normal Metabolizer	No FDA guidance for your genotype	FDA
✓	Mercaptopurine	Purinethol	TPMT	Normal Metabolizer	*Combined implication:* Both TPMT and NUDT15 predict normal thiopurine metabolism and a normal risk of myelosuppression. *Recommendation:* Initiate therapy with standard starting dose of mecaptopurine (e.g., 75 mg/m2/day for malignancy or 1.5 mg/kg/day for nonmalignancy). During therapy, adjust the doses of myelosuppressive agents, as per standard clinical practice. It usually takes at least 2 weeks of stable dosing to reach steady state after each dose adjustment. Evidence strength: Strong From the combined TPMT and NUDT15 table in CPIC's thiopurine guideline.	CPIC
			NUDT15	Normal Metabolizer		
✓	Nilotinib	Tasigna	UGT1A1	Normal Metabolizer	No FDA guidance for your genotype	FDA
✓	Pazopanib	Votrient	UGT1A1	Normal Metabolizer	No FDA guidance for your genotype	FDA
✓	Sacituzumab Govitecan-Hziy	Trodelvy	UGT1A1	Normal Metabolizer	No FDA guidance for this phenotype	FDA
✓	Thioguanine	Lanvis, Tabloid	TPMT	Normal Metabolizer	*Combined implication:* Both TPMT and NUDT15 predict normal thiopurine metabolism and a normal risk of myelosuppression. *Recommendation:* Initiate therapy with standard starting dose of thioguanine (e.g., 40 mg/m2/day for malignancy). During therapy, adjust the doses of myelosuppressive agents, as per standard clinical practice. It usually takes at least 2 weeks of stable dosing to reach steady state after each dose adjustment. Evidence strength: Strong From the combined TPMT and NUDT15 table in CPIC's thiopurine guideline.	CPIC
			NUDT15	Normal Metabolizer		

Estrogen Modulators

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
✓	Tamoxifen	Nolvadex, Soltamox	CYP2D6	Ultrarapid Metabolizer	*Implication:* Therapeutic endoxifen concentrations *Therapeutic recommendation:* Avoid moderate and strong CYP2D6 inhibitors. Initiate therapy with recommended standard of care dosing (tamoxifen 20 mg/day).	CPIC

Immunosuppressants

4 drugs

USE AS DIRECTED 2	USE WITH CAUTION 2	CONSIDER ALTERNATIVE 0
Abrocitinib CYP2C19	Siponimod CYP2C9	*No drugs in this category.*
Azathioprine NUDT15, TPMT	Tacrolimus CYP3A5	

Each card shows the gene driving the recommendation. Use as directed = your genetics suggest a typical response. Use with caution = consider dose adjustment or monitoring. Consider alternative = guidelines suggest discussing a different drug with your provider.

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
✓	Abrocitinib	Cibinqo	CYP2C19	Intermediate Metabolizer	No FDA guidance for this phenotype	FDA
✓	Azathioprine	Imuran	TPMT	Normal Metabolizer	*Combined implication:* Both TPMT and NUDT15 predict normal thiopurine metabolism and a normal risk of myelosuppression. *Recommendation:* Initiate therapy with standard starting dose (e.g., 2 mg/kg/day for autoimmune diseases). During therapy, adjust doses of azathioprine based on disease-specific guidelines. It usually takes at least 2 weeks to reach steady state after each dose adjustment. Evidence strength: Strong From the combined TPMT and NUDT15 table in CPIC's thiopurine guideline.	CPIC
			NUDT15	Normal Metabolizer		
⚠	Siponimod	Mayzent	CYP2C9	Intermediate Metabolizer	Results in higher systemic concentrations. Adjust dosage based on genotype. Refer to FDA labeling for specific dosing recommendations.	FDA
⚠	Tacrolimus	Prograf	CYP3A5	Intermediate Metabolizer	**CPIC**: *Implication:* Lower dose-adjusted trough concentrations of tacrolimus and decreased chance of achieving target tacrolimus concentrations *Therapeutic recommendation:* Increase starting dose 1.5 to 2 times recommended starting dose. Total starting dose should not exceed 0.3mg/kg/day. Use therapeutic drug monitoring to guide dose adjustments **FDA**: Results in lower systemic concentrations, lower probability of achieving target concentrations and may result in higher rejection risk. Measure drug concentrations and adjust dosage based on trough whole blood tacrolimus concentrations.	CPIC, FDA

Antivirals

5 drugs

USE AS DIRECTED 1	USE WITH CAUTION 0	CONSIDER ALTERNATIVE 3	INFORMATIONAL / UNABLE TO DETERMINE 1
Atazanavir UGT1A1	*No drugs in this category.*	Peginterferon Alfa-2A IFNL3	Efavirenz CYP2B6
		Peginterferon Alfa-2B IFNL3	
		Ribavirin IFNL3	

Each card shows the gene driving the recommendation. Use as directed = your genetics suggest a typical response. Use with caution = consider dose adjustment or monitoring. Consider alternative = guidelines suggest discussing a different drug with your provider.

Antiretrovirals

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
✓	Atazanavir	Reyataz, Evotaz, Others	UGT1A1	Normal Metabolizer	*Implication:* Reference UGT1A1 activity; very low likelihood of bilirubin-related discontinuation of atazanavir. *Therapeutic recommendation:* There is no need to avoid prescribing of atazanavir based on UGT1A1 genetic test result.	CPIC
?	Efavirenz	Sustiva	CYP2B6	Indeterminate	**CPIC**: *Implication:* No CPIC guidance for your genotype *Therapeutic recommendation:* A genotype-based dosing recommendation cannot be determined from this result. **FDA**: No FDA guidance for your genotype	CPIC, FDA

Antivirals

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
⚠	Peginterferon Alfa-2A	Pegasys	IFNL3	✕ Unfavorable response genotype	*Implication:* Approximately 30% chance for sustained virologic response (SVR) after 48 weeks of treatment. Consider implications before initiating PEG-IFN alpha and RBV containing regimens. *Therapeutic recommendation:* Approximately 60% chance for SVR after 24-48 weeks of treatment. Approximately 50% of patients are eligible for shortened therapy (24-28 weeks). Consider implications before initiating PEG-IFN alpha and RBV containing regimens.	CPIC
⚠	Peginterferon Alfa-2B	PegIntron	IFNL3	✕ Unfavorable response genotype	*Implication:* Approximately 30% chance for sustained virologic response (SVR) after 48 weeks of treatment. Consider implications before initiating PEG-IFN alpha and RBV containing regimens. *Therapeutic recommendation:* Approximately 60% chance for SVR after 24-48 weeks of treatment. Approximately 50% of patients are eligible for shortened therapy (24-28 weeks). Consider implications before initiating PEG-IFN alpha and RBV containing regimens.	CPIC
⚠	Ribavirin	Copegus, Rebetol, Virazole	IFNL3	✕ Unfavorable response genotype	*Implication:* Approximately 30% chance for sustained virologic response (SVR) after 48 weeks of treatment. Consider implications before initiating PEG-IFN alpha and RBV containing regimens. *Therapeutic recommendation:* Approximately 60% chance for SVR after 24-48 weeks of treatment. Approximately 50% of patients are eligible for shortened therapy (24-28 weeks). Consider implications before initiating PEG-IFN alpha and RBV containing regimens.	CPIC

Antifungals

1 drug

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
⚠	Voriconazole	Vfend	CYP2C19	Intermediate Metabolizer	**CPIC**: *Implication:* Higher dose-adjusted trough concentrations of voriconazole compared to normal metabolizers. *Therapeutic recommendation:* Initiate therapy with recommended standard of care dosing. **FDA**: Results in higher systemic concentrations and may result in higher adverse reaction risk.	CPIC, FDA

Anesthetics

8 drugs

USE AS DIRECTED 1	USE WITH CAUTION 0	CONSIDER ALTERNATIVE 0	NO KNOWN RISK VARIANTS FOUND 7
Mivacurium BCHE	*No drugs in this category.*	*No drugs in this category.*	Desflurane CACNA1S, RYR1
			Enflurane CACNA1S, RYR1
			Halothane CACNA1S, RYR1
			Isoflurane CACNA1S, RYR1
			Methoxyflurane CACNA1S, RYR1
			Sevoflurane CACNA1S, RYR1
			Succinylcholine BCHE, CACNA1S, RYR1

Each card shows the gene driving the recommendation. Use as directed = your genetics suggest a typical response. Use with caution = consider dose adjustment or monitoring. Consider alternative = guidelines suggest discussing a different drug with your provider. No known risk variants found = the anesthesia genes were checked and no listed risk variant was found. This doesn't rule out the risk.

RYR1/CACNA1S screening: No known risk variants found. No CPIC-listed malignant-hyperthermia-associated variant was detected in the supplied WGS data. Susceptibility remains uncertain: this targeted screen cannot rule out malignant hyperthermia, and coverage at sites absent from your file could not be verified.

RYR1: No known risk variants found

Coverage at absent sites is unverified; absent records are not reference calls.

CACNA1S: No known risk variants found

Coverage at absent sites is unverified; absent records are not reference calls.

CPIC guideline

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
?	Desflurane	Various brands available	RYR1	? No known risk variants found	*Combined implication:* No known CPIC-listed malignant-hyperthermia-associated variants were identified in RYR1 or CACNA1S in the supplied WGS data. These results do not eliminate the chance that this patient is susceptible to malignant hyperthermia (MH). The genetic cause of about half of all MH survivors, with MH susceptibility confirmed by contracture test, remains unknown (PMID 28902675). *Recommendation:* Clinical findings, family history, further genetic testing and other laboratory data should guide use of halogenated volatile anesthetics or depolarizing muscle relaxants. Evidence strength: None	CPIC
			CACNA1S	? No known risk variants found		
?	Enflurane	Various brands available	RYR1	? No known risk variants found	*Combined implication:* No known CPIC-listed malignant-hyperthermia-associated variants were identified in RYR1 or CACNA1S in the supplied WGS data. These results do not eliminate the chance that this patient is susceptible to malignant hyperthermia (MH). The genetic cause of about half of all MH survivors, with MH susceptibility confirmed by contracture test, remains unknown (PMID 28902675). *Recommendation:* Clinical findings, family history, further genetic testing and other laboratory data should guide use of halogenated volatile anesthetics or depolarizing muscle relaxants. Evidence strength: None	CPIC
			CACNA1S	? No known risk variants found		
?	Halothane	Various brands available	RYR1	? No known risk variants found	*Combined implication:* No known CPIC-listed malignant-hyperthermia-associated variants were identified in RYR1 or CACNA1S in the supplied WGS data. These results do not eliminate the chance that this patient is susceptible to malignant hyperthermia (MH). The genetic cause of about half of all MH survivors, with MH susceptibility confirmed by contracture test, remains unknown (PMID 28902675). *Recommendation:* Clinical findings, family history, further genetic testing and other laboratory data should guide use of halogenated volatile anesthetics or depolarizing muscle relaxants. Evidence strength: None	CPIC
			CACNA1S	? No known risk variants found		
?	Isoflurane	Various brands available	RYR1	? No known risk variants found	*Combined implication:* No known CPIC-listed malignant-hyperthermia-associated variants were identified in RYR1 or CACNA1S in the supplied WGS data. These results do not eliminate the chance that this patient is susceptible to malignant hyperthermia (MH). The genetic cause of about half of all MH survivors, with MH susceptibility confirmed by contracture test, remains unknown (PMID 28902675). *Recommendation:* Clinical findings, family history, further genetic testing and other laboratory data should guide use of halogenated volatile anesthetics or depolarizing muscle relaxants. Evidence strength: None	CPIC
			CACNA1S	? No known risk variants found		
?	Methoxyflurane	Various brands available	RYR1	? No known risk variants found	*Combined implication:* No known CPIC-listed malignant-hyperthermia-associated variants were identified in RYR1 or CACNA1S in the supplied WGS data. These results do not eliminate the chance that this patient is susceptible to malignant hyperthermia (MH). The genetic cause of about half of all MH survivors, with MH susceptibility confirmed by contracture test, remains unknown (PMID 28902675). *Recommendation:* Clinical findings, family history, further genetic testing and other laboratory data should guide use of halogenated volatile anesthetics or depolarizing muscle relaxants. Evidence strength: None	CPIC
			CACNA1S	? No known risk variants found		
✓	Mivacurium	Mivacron	BCHE	✓ Normal Metabolizer	Normal BCHE activity and expected metabolism of mivacurium.	FDA
?	Sevoflurane	Various brands available	RYR1	? No known risk variants found	*Combined implication:* No known CPIC-listed malignant-hyperthermia-associated variants were identified in RYR1 or CACNA1S in the supplied WGS data. These results do not eliminate the chance that this patient is susceptible to malignant hyperthermia (MH). The genetic cause of about half of all MH survivors, with MH susceptibility confirmed by contracture test, remains unknown (PMID 28902675). *Recommendation:* Clinical findings, family history, further genetic testing and other laboratory data should guide use of halogenated volatile anesthetics or depolarizing muscle relaxants. Evidence strength: None	CPIC
			CACNA1S	? No known risk variants found		
✓	Succinylcholine	Quelicin, Anectine	BCHE	✓ Normal Metabolizer	Normal BCHE activity and expected metabolism of succinylcholine.	FDA

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
?	Succinylcholine	Various brands available	RYR1	? No known risk variants found	*Combined implication:* No known CPIC-listed malignant-hyperthermia-associated variants were identified in RYR1 or CACNA1S in the supplied WGS data. These results do not eliminate the chance that this patient is susceptible to malignant hyperthermia (MH). The genetic cause of about half of all MH survivors, with MH susceptibility confirmed by contracture test, remains unknown (PMID 28902675). *Recommendation:* Clinical findings, family history, further genetic testing and other laboratory data should guide use of halogenated volatile anesthetics or depolarizing muscle relaxants. Evidence strength: None	CPIC
			CACNA1S	? No known risk variants found		

Weight management

3 drugs

USE AS DIRECTED 3	USE WITH CAUTION 0	CONSIDER ALTERNATIVE 0
Retatrutide GIPR, GLP1R	*No drugs in this category.*	*No drugs in this category.*
Semaglutide GLP1R		
Tirzepatide GIPR, GLP1R		

Each card shows the gene driving the recommendation. Use as directed = your genetics suggest a typical response. Use with caution = consider dose adjustment or monitoring. Consider alternative = guidelines suggest discussing a different drug with your provider.

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
✓	Retatrutide	Various brands available	GLP1R	✓ Typical Response	*Combined implication:* GLP1R: the more common Pro7/Pro7 form of the signal peptide (rs10305420 C/C). GIPR: full-function Glu354/Glu354 (rs1800437 G/G). This is the lowest-risk genotype pair for GI side effects. Expected weight-loss efficacy from the GLP1R arm of retatrutide. GIPR is full-function, so it adds no extra GI risk on retatrutide. *Recommendation:* Standard dosing and titration are expected to produce an average response. Evidence strength: Weak Gene2Rx guideline extrapolated from the tirzepatide results in Su et al., Nature (2026). Retatrutide, an investigational GIP, GLP-1 and glucagon receptor agonist, has no genetic study of its own, so this assumes the GLP1R and GIPR variants act as they do with tirzepatide, which also acts on both receptors.	Gene2Rx
			GIPR	✓ Normal Function		
✓	Semaglutide	Ozempic, Wegovy	GLP1R	✓ Typical Response	*Implication:* The Pro7/Pro7 form of the GLP1R signal peptide (rs10305420 C/C). The Leu7 (T) allele is the less common one in every ancestry group studied. Expected weight-loss efficacy and typical nausea/vomiting risk. *Therapeutic recommendation:* Standard dosing and titration are expected to produce an average response.	Gene2Rx
✓	Tirzepatide	Mounjaro, Zepbound	GLP1R	✓ Typical Response	*Combined implication:* GLP1R: the more common Pro7/Pro7 form of the signal peptide (rs10305420 C/C). GIPR: full-function Glu354/Glu354 (rs1800437 G/G). This is the lowest-risk genotype pair: estimated risk of moderate-to-severe vomiting on tirzepatide is about 2.5%, and nausea about 14%. Expected weight-loss efficacy from the GLP1R arm of tirzepatide. GIPR is full-function, so it adds no extra GI risk on tirzepatide. *Recommendation:* Standard dosing and titration are expected to produce an average response. Evidence strength: Moderate Gene2Rx guideline based on Su et al., Nature (2026), which linked GLP1R rs10305420 and GIPR rs1800437 to nausea and vomiting on tirzepatide. The GIPR effect was specific to tirzepatide and was not seen with semaglutide.	Gene2Rx
			GIPR	✓ Normal Function		

Antidiabetics

1 drug

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
✓	Nateglinide	Starlix	CYP2C9	↓ Intermediate Metabolizer	No FDA guidance for this phenotype	FDA

Antihistamines

1 drug

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
⚠	Meclizine	Antivert	CYP2D6	Ultrarapid Metabolizer	May affect systemic concentrations. Monitor for adverse reactions and clinical effect.	FDA

Drugs used in addictive disorders

1 drug

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
✓	Lofexidine	Lucemyra	CYP2D6	Ultrarapid Metabolizer	No FDA guidance for your genotype	FDA

Female sexual health

1 drug

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
✓	Flibanserin	Addyi	CYP2C19	Intermediate Metabolizer	No FDA guidance for your genotype	FDA

Gaucher's disease treatments

1 drug

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
⚠	Eliglustat	Cerdelga	CYP2D6	Ultrarapid Metabolizer	Ultrarapid metabolizers may not achieve adequate concentrations to achieve a therapeutic effect.	FDA

Gout

1 drug

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
✓	Allopurinol	Zyloprim	ABCG2	Normal Function	Normal ABCG2 transporter function. Renal and intestinal uric acid excretion is not impaired by ABCG2 variation at p.Gln141Lys.	DPWG

Hair loss

1 drug

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
⚠	Minoxidil	Rogaine	SULT1A1	Decreased Function	*Implication:* Your SULT1A1 result suggests reduced enzyme function. This enzyme helps activate topical minoxidil (Rogaine). Reduced activation may limit hair regrowth, even with consistent use. This result does not rule out benefit from treatment. *Therapeutic recommendation:* If hair growth is limited despite consistent use, discuss additional or alternative treatments with your clinician.	Gene2Rx

Saliva production stimulators

1 drug

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
✓	Cevimeline	Evoxac	CYP2D6	Ultrarapid Metabolizer	No FDA guidance for your genotype	FDA

Urologicals

1 drug

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
✓	Tolterodine	Detrol	CYP2D6	Ultrarapid Metabolizer	No FDA guidance for your genotype	FDA

Other substances

7 drugs

USE AS DIRECTED 3	USE WITH CAUTION 3	CONSIDER ALTERNATIVE 0	INFORMATIONAL / UNABLE TO DETERMINE 1
Alcohol ADH1B, ALDH2	MDMA COMT, CYP2D6	*No drugs in this category.*	Ketamine CYP2B6
Caffeine CYP1A2	Nicotine CHRNA5, COMT, CYP2A6		
LSD CYP2D6	THC AKT1, COMT, CYP2C9, FAAH		

Each card shows the gene driving the recommendation. Use as directed = your genetics suggest a typical response. Use with caution = consider dose adjustment or monitoring. Consider alternative = guidelines suggest discussing a different drug with your provider.

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
✓	Alcohol		ADH1B	✓ Normal Function	*Implication:* Two Arg48 alleles (rs1229984). Usual rate of ethanol oxidation. Compared with His48 carriers, associated with higher risk of alcohol dependence and, among heavy drinkers in East Asian studies, higher risk of esophageal and head and neck cancer. Only rs1229984 is assessed: ADH1B*3 (rs2066702), common in people of African ancestry, is not read, so its carriers are reported here. *Therapeutic recommendation:* Follow standard guidelines for alcohol consumption.	Gene2Rx
			ALDH2	✓ Normal Function	*Implication:* Two Glu504 alleles (rs671 G/G, ALDH2*1/*1). Normal acetaldehyde clearance; typical risk of flushing, hangover and alcohol dependence for this gene. *Therapeutic recommendation:* Standard advice on drinking limits.	Gene2Rx
✓	Caffeine	Coffee, Tea	CYP1A2	✓ Normal Metabolizer	*Implication:* No rs762551 A allele and no F186L allele (*1/*1), or one of each. Expected caffeine clearance. Note: in the coffee and cardiovascular literature, C/C is classed as a 'slow' metabolizer genotype. *Therapeutic recommendation:* Follow standard moderate intake guidance (up to 400 mg a day for most adults).	Gene2Rx
?	Ketamine	Ketalar	CYP2B6	? Indeterminate	*Implication:* The alleles detected cannot be assigned a CYP2B6 function, so no phenotype can be inferred. *Therapeutic recommendation:* A genotype-based dosing recommendation cannot be determined from this result.	Gene2Rx
✓	LSD	Acid	CYP2D6	↑ Ultrarapid Metabolizer	*Implication:* Increased CYP2D6 activity, so faster LSD clearance is expected. The pooled clinical analysis compared participants with no functional CYP2D6 against carriers of functional CYP2D6 and did not examine ultrarapid metabolizers separately. This result cannot be produced from uploaded data, because increased-function CYP2D6 alleles are gene duplications, which are not detected. *Therapeutic recommendation:* No genotype-based adjustment. Monitor participant-reported experiential responses.	Gene2Rx
⚠	MDMA	Ecstasy	COMT	↓ Decreased Function	*Implication:* Two rs4680 A alleles (Met158/Met158), the lower-activity form. In a controlled study, lower-activity COMT genotypes were associated with more negative subjective effects after MDMA, specifically dizziness, anxiety and sedation. In a field study of clubbers, low-activity COMT genotypes were associated with larger falls in plasma sodium and osmolality, the mechanism behind MDMA-related dilutional hyponatraemia. *Therapeutic recommendation:* If exposure occurs, monitor neurological and cardiovascular status and fluid intake. Both supporting studies are small and unreplicated.	Gene2Rx
			CYP2D6	↑ Ultrarapid Metabolizer	*Implication:* Increased CYP2D6 activity, so faster O-demethylenation of MDMA is expected. No study has examined MDMA in ultrarapid metabolizers. This result cannot be produced from uploaded consumer array or sequencing data, because increased-function CYP2D6 alleles are gene duplications, which are not detected. *Therapeutic recommendation:* No genotype-based adjustment. MDMA has no approved medical use; if exposure occurs, monitor body temperature, blood pressure and neurological status.	Gene2Rx
⚠	Nicotine	Cigarettes, Zyn	CHRNA5	✓ Normal Function	*Implication:* rs16969968 G/G (Asp398/Asp398). No added risk of heavier smoking or delayed cessation from this variant. *Therapeutic recommendation:* Typical response to nicotine. Standard cessation counseling and pharmacotherapy as indicated.	Gene2Rx
			COMT	↓ Decreased Function	*Implication:* rs4680 Met/Met. Lowest COMT activity (Met is described as having 3 to 4 times lower activity than Val). Some studies associate Met/Met with better quitting on nicotine replacement and others find weak or no association with smoking heaviness or cessation. *Therapeutic recommendation:* No reliable genotype-based change to cessation treatment; standard counseling and pharmacotherapy.	Gene2Rx

	GENERIC NAME	BRAND NAMES	GENE	YOUR GENE PHENOTYPE	IMPLICATION	SOURCE
			CYP2A6	Intermediate Metabolizer	*Implication:* One reduced-function allele. Nicotine clearance is moderately reduced, giving modestly higher and longer-lasting nicotine levels; reduced CYP2A6 function is associated with smoking fewer cigarettes per day. *Therapeutic recommendation:* Nicotine remains in circulation longer; no change to standard cessation treatment is needed on the basis of this result.	Gene2Rx
⚠	THC	Cannabis, Marijuana	AKT1	Normal Function	*Implication:* Two rs2494732 T alleles. In the gene-environment studies of cannabis and psychosis, this genotype showed no excess of psychotic-like effects. *Therapeutic recommendation:* No AKT1-based adjustment. The usual risk of transient psychotic-like effects from THC applies.	Gene2Rx
			COMT	Decreased Function	*Implication:* Two rs4680 A alleles (Met158/Met158). Lower COMT activity and higher baseline prefrontal dopamine. Whether this reduces the psychotomimetic response to THC is unresolved: a meta-analysis of gene-environment studies found the interaction significant only in case-only designs, where Met/Met was the risk genotype, and a pooled analysis of placebo-controlled THC studies found the strongest dysphoric reactions in Met/Met participants. *Therapeutic recommendation:* No COMT-based adjustment. Monitor for unexpected reactions; this genotype should not be interpreted as protective.	Gene2Rx
			CYP2C9	Intermediate Metabolizer (Activity Score 1.5)	*Implication:* Activity score 1.5 (one decreased-function allele, usually *2). Slightly reduced hydroxylation of THC. In the only published pharmacokinetic study of oral THC by CYP2C9 genotype, *2 status alone did not change THC exposure, so any increase at this activity score is expected to be small. *Therapeutic recommendation:* Initiate at standard doses. Monitor for increased sedation or psychotropic intensity.	Gene2Rx
			FAAH	Decreased Function	*Implication:* One or two rs324420 A alleles (Pro129Thr). The variant protein is catalytically normal but less stable, and homozygous carriers have under half the usual FAAH protein and activity; brain imaging shows lower FAAH binding in A-allele carriers. Baseline anandamide tone is therefore higher. The consequences for cannabis are unresolved: the variant was associated with problem drug use in the original reports, but in cannabis-specific studies A/A carriers were less likely to be THC dependent and C/C carriers reported more craving after abstinence. *Therapeutic recommendation:* No reliable FAAH-based dose adjustment can be given. If THC is used, monitor for unusually intense subjective effects or craving.	Gene2Rx

Frequently Asked Questions

What do I do now?
If you find that you may have an atypical response to a medication you take or are considering taking, it is important that you first consult with your healthcare provider or a genetic counselor before making any changes.

Should I change medications or dosage based on my report?
No! Do not alter your medication dosage or stop taking your medication without first consulting your healthcare provider.

Why shouldn't I change my medication based on this report?
Direct-to-consumer data is not clinical grade, so anything included in the report should be used as a conversation starter with your healthcare provider to seek the appropriate clinical laboratory test.

Are these expert annotations?
The source is identified beside each finding. This report includes CPIC, FDA, DPWG, and Gene2Rx interpretations with different levels of evidence. Gene2Rx interpretations are not necessarily endorsed by those organizations. Gene2Rx interpretations explain the supporting research and its limitations alongside the finding.

More questions?
Contact us at contact@gene2rx.com.