pillcheck

Customer Sample ID	random1
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Guide to Using Your Pillcheck

Welcome to your Pillcheck pharmacogenetic test results! They show how your DNA affects your response to many prescription medications. Your results can help determine safer, more effective medications and dosages to fit your unique genetic profile. They can also provide peace of mind that medications you're currently taking are the right ones for you.

There are four parts to your Pillcheck results:

1. **Summary of Your Test** - for you to learn which medications you have a higher risk of side effects or poor response
2. **Information for Specialists** - your genetic profile and test details for healthcare providers
3. **Personalized Results for You** - use it for any medications you may need in the future
4. **Pharmacist Opinion Letter** - your pharmacist action plan with personalized treatment recommendations. Take this to your doctor to discuss (available now as a separate document in your account)

How to use the Summary of Your Test

The colour-coded summary of your Pillcheck shows your predicted risk for all medications included on the test. These are key medical facts about you that your doctor should consider. Use it to check prescriptions you're taking now and for any new medication being considered in the future. The summary shows which medications may be right for you and which ones should be used with extra caution. Click any drug name in the summary to see your detailed test results for it.

You may not recognize the names of the drugs in your report because they are 'generic' drug names. If you check the label of your prescriptions, you should be able to find the generic name and then find it in the report.

Meaning of the symbols in your report

Normal drug metabolism and response. No additional dose adjustment needed.

Altered drug metabolism. Can affect clinical response, may require dose adjustment or increased monitoring.

Substantially altered drug metabolism. Requires physicians to adjust dose or consider alternative medications.

Uncertain activity requires caution in drug use. A rare or indeterminate combination of genetic markers is present.

What to do with your Pillcheck Results

- Bring a copy of your Pharmacist Opinion Letter to your doctor or pharmacist (either print or bring on a mobile device).
- Discuss your Pillcheck results with your doctor to improve efficacy and safety of your treatment plan.
- Since your genetic make-up doesn't change, be sure to consult your Pillcheck Report whenever you are prescribed new medications.
- You can grant your doctor/pharmacist online access to your full Pillcheck report by sending us your provider's name, email, phone, and fax numbers.

You or your provider can contact us at support@pillcheck.ca, 1-877-409-3629, or contact the pharmacist listed on your Pharmacist Opinion Letter if you have any questions about your Pillcheck. More information for healthcare providers can be found at www.pillcheck.ca/providers.

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Other Notes

- It's possible that your report will indicate there are no issues with any of the medications you're taking (for example, they're all in the Green category), yet you may still feel you are having issues. There may be other factors involved in how you respond to medications (such as your medical condition, age, liver and kidney function, etc.). Your doctor is the best person to discuss this with.
- Although Pillcheck is a comprehensive pharmacogenetic test, not all medications are listed on the report, even ones you may currently be taking. This is because not all drugs can be assessed by pharmacogenetics or there is not enough clinical information yet to report on certain medications.
- We'll update your report as new information on medications become available. We'll contact you by email to let you know when your report is updated.

DO NOT CHANGE ANY MEDICATIONS OR DOSAGE PRIOR TO CONSULTING YOUR PHYSICIAN OR PHARMACIST, WHO SHOULD DETERMINE AN APPROPRIATE DOSE. Please note, this report is intended for educational purposes only and does not constitute medical advice.

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Summary of Your Test

TREATMENT AREA	CONSIDER ALTERNATIVES	USE WITH CAUTION	STANDARD PRECAUTION
Analgesics	Buprenorphine Celecoxib Codeine Flurbiprofen Ibuprofen Lornoxicam Meloxicam Oxycodone Piroxicam Tenoxicam Tramadol and acetaminophen	Diclofenac Hydrocodone Lofexidine Nabumetone Tolperisone	Carisoprodol Fentanyl Hydromorphone Methadone Morphine Naloxone Naltrexone Naproxen Propofol
Antiemetics	Aprepitant Dronabinol Fosaprepitant Meclizine Rolapitant	Dolasetron Ondansetron Palonosetron Tropisetron	
Antifungal	Itraconazole Posaconazole	Terbinafine	Voriconazole
Antiviral	Fosamprenavir	Darunavir Maraviroc Nirmatrelvir / ritonavir	Atazanavir Dolutegravir Efavirenz Nevirapine Raltegravir Remdesivir

CAUTION: Do not change any medications or dosage prior to consulting your physician or pharmacist, who should determine an appropriate dose.

Cardiovascular	Acenocoumarol Amlodipine Atorvastatin Azilsartan Candesartan Dronedarone Fenofibrate / simvastatin Fluindione Fluvastatin Guanfacine Irbesartan Ivabradine Losartan Lovastatin Mavacamten Metoprolol Phenprocoumon Pitavastatin Pravastatin Propafenone Rosuvastatin Sildenafil Simvastatin Tadalafil Ticagrelor Valsartan Vardenafil Warfarin	Apixaban Cilostazol Flecainide Mexiletine Nebivolol Propranolol Ranolazine Rivaroxaban Timolol Vernakalant	Alirocumab Carvedilol Clopidogrel Evolocumab Labetalol Nicardipine Prasugrel Quinidine
Dermatology and Dental			Abrocitinib
Endocrinology	Eliglustat		
Gastroenterology		Metoclopramide	Dexlansoprazole Esomeprazole Lansoprazole Omeprazole Pantoprazole Rabeprazole
Gynecology	Elagolix		Flibanserin
Hematology	Acenocoumarol Phenprocoumon Warfarin	Apixaban Rivaroxaban	

CAUTION: Do not change any medications or dosage prior to consulting your physician or pharmacist, who should determine an appropriate dose.

Immune therapy	Methotrexate Siponimod Tacrolimus	Azathioprine Cyclosporine Everolimus Mercaptopurine Sirolimus Temsirolimus Thioguanine	Abrocitinib Leflunomide
Neurology	Cannabidiol Eletriptan Fosphenytoin Perampanel Phenytoin Trazodone Valproic acid / divalproex Zonisamide Zopiclone	Deutetrabenazine Dextromethorphan and quinidine Galantamine Midazolam Tetrabenazine Triazolam Valbenazine	Brivaracetam Lacosamide Rasagiline
Oncology	Adagrasib Cabazitaxel Erdafitinib Regorafenib Ruxolitinib Sunitinib	Azathioprine Cisplatin Everolimus Gefitinib Mercaptopurine Sirolimus Tamoxifen Temsirolimus Thioguanine	Belinostat Capecitabine Erlotinib Flucytosine Fluorouracil Irinotecan Nilotinib Pazopanib Sacituzumab govitecan Tegafur

Psychiatry	Amitriptyline Amoxapine Atomoxetine Buprenorphine Buspirone Cariprazine Chlordiazepoxide and amitriptyline Clomipramine Clonazepam Desipramine Doxepin Eszopiclone Guanfacine Haloperidol Imipramine Levomilnacipran Lurasidone Milnacipran Nortriptyline Paroxetine Pimozide Protriptyline Risperidone Trimipramine Vilazodone Ziprasidone Zuclopenthixol	Agomelatine Alprazolam Amphetamine Aripiprazole Brexpiprazole Clozapine Dapoxetine Dextroamphetamine Diazepam Donepezil Duloxetine Fluoxetine Fluoxetine and olanzapine Flupentixol Fluvoxamine Iloperidone Maprotiline Mirtazapine Modafinil Nefazodone Perphenazine Pitolisant Quetiapine Sertindole Thioridazine Thiothixene Venlafaxine Viloxazine Vortioxetine	Asenapine Bupropion Caffeine Chlorpromazine Citalopram Clobazam Escitalopram Fluphenazine Ketamine Loxapine Moclobemide Olanzapine Sertraline
Pulmonology		Dextromethorphan and promethazine	Indacaterol
Rheumatology	Flurbiprofen Lesinurad Piroxicam Upadacitinib	Cevimeline	
Urology	Mirabegron	Darifenacin Fesoterodine Tamsulosin Tolterodine	

The outcome is uncertain for the following drugs:

Enzalutamide

Pamidronate

Information for Specialists

Customer Genetic Profile

Biomarker	Value
CYP1A2	*1A/*1A
CYP2B6	*1/*1
CYP2C19	*1/*1
CYP2C8	*4/*4
CYP2C9	*3/*3
CYP2D6	*1/*1
CYP2D6 CNV	3N
CYP3A4	*6/*6

Biomarker	Value
CYP3A5	*1/*3
DPYD	*1/*1
OPRM1	A/A
SLCO1B1	*5/*5
TPMT	*1/*2
UGT1A1	*1/*1
VKORC1	T/T

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Technology used in the testing process

Gene	Alleles Tested
CYP1A2	*1E, *1F, *1J, *1K, *6, *7, *8, *15
CYP2B6	*2, *5, *6, *7, *8, *13, *18, *22, *34
CYP2C19	*2, *3, *4, *6, *8, *10, *17
CYP2C8	*2, *3, *4
CYP2C9	*2, *3, *9, *11, *12
CYP2D6	*3, *4, *5, *6, *7, *10, *17, *29, *41, *64, *69, *82
CYP3A4	*3, *6, *11, *12, *16, *17, *18, *19, *22
CYP3A5	*2, *3, *6
DPYD	*2A, *4, *5, *6, *9A, c.2846A>T
OPRM1	rs1799971 A/G
SLCO1B1	*1B, *5, *9, *15, *31
TPMT	*2, *3A, *8
UGT1A1	*6, *27, *80
VKORC1	rs9923231 C/T

Technology: Genotyping was performed using the Applied Biosystems™ QuantStudio™ platform and this report is powered by Pillcheck technology.

Limitations: This test will not detect all known mutations that result in altered gene activity. *1 or wild-type alleles are reported by default if those listed were not detected. IND values are conservatively assigned to alleles that could not be determined with complete certainty. Only listed mutations are tested for and absence of a detected mutation does not rule out the possibility of sensitivity to a specific drug due to the presence of other mutations or other environmental factors.

Additional genetic testing by sequencing might uncover other functional variations that the individual may carry that also affect the medication response, but were not detected in this analysis.

Drug Page Index

Personalized Results for You

Abrocitinib

General drug info:
https://new-portal.pillcheck.net/medication/R3Y4

Normal abrocitinib clearance is anticipated. Follow standard starting dose recommendations. Abrocitinib is contraindicated in patients taking antiplatelet therapies, except for low-dose aspirin (≤81 mg daily), during the first 3 months of treatment. Avoid use of stong or moderate inhibitors of CYP2C19 and/or CYP2C9. When co-administration of strong CYP2C19 inhibitor is required, reduce the starting dose to 50mg once daily. If an adequate response is not achieved with 50 mg orally daily after 12 weeks, consider increasing daily dosage to 100 mg. Discontinue therapy if inadequate response is seen after dosage increase to 100 mg. EMA and Health Canada drug labels do not require dose adjustment.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	FDA

Acenocoumarol

General drug info:
https://new-portal.pillcheck.net/medication/E4C8

Use 50% of the standard initial dose and more frequent monitoring of the INR. Consider alternative treatment with Factor Xa inhibitors.

Biomarker	Value	Interpretation	Level of evidence
CYP2C9	*3/*3	Poor metabolizer	CPIC B
VKORC1	T/T	Low Vitamin K production	CPIC B

Adagrasib

General drug info:
https://new-portal.pillcheck.net/medication/X7E9

Significantly reduced adagrasib clearance is anticipated. Be altered to increase the risk of QT prolongation, gastrointestinal and other side effects. Avoid concomitant use of adagrasib with other products with a known potential to prolong the QTc interval. Avoid the use of CYP3A4 inhibitors.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Agomelatine

General drug info:
https://new-portal.pillcheck.net/medication/K7V4

Be alert about potentially reduced agomelatine exposure and reduced clinical response in smoking patients. Other environmental factors can affect agomelatine concentrations. Avoid concomitant use of potent CYP1A2 inhibitors (e.g. fluvoxamine, ciprofloxacin).

Biomarker	Value	Interpretation	Level of evidence
CYP1A2	*1A/*1A	Normal metabolizer	EMA
CYP2C9	*3/*3	Poor metabolizer	EMA

Alirocumab

General drug info:
https://new-portal.pillcheck.net/medication/Y6X4

The variation you carry in the SLCO1B1 gene indicates that you have a high myopathy risk and will be statin-intolerant. Consider treatment with PCSK9 inhibitors.

Biomarker	Value	Interpretation	Level of evidence
SLCO1B1	*5/*5	Poor function	FDA

Alprazolam

General drug info:
https://new-portal.pillcheck.net/medication/E9L2

Significantly reduced clearance by CYP3A4 might be somewhat offset by increased clearance by CYP3A5. Be alert to potentially altered clinical response and signs of side effects. Other clinical and genetic factors may also influence the clearance and metabolism of alprazolam, midazolam and triazolam.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA
CYP3A5	*1/*3	Intermediate metabolizer	FDA

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Amitriptyline

General drug info:
https://new-portal.pillcheck.net/medication/Y7Y6

Avoid the use of amitriptyline, clomipramine, doxepin, imipramine, trimipramine due to significantly enhanced clearance and reduced response.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	CPIC A
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC A

Amlodipine

General drug info:
https://new-portal.pillcheck.net/medication/N3Q6

Significantly reduced drug clearance is anticipated, increasing amlodipine systemic exposure. Significantly increased risk of hypotension and edema, especially when amlodipine is coadministered with CYP3A4 inhibitors.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Amoxapine

General drug info:
https://new-portal.pillcheck.net/medication/P4H9

Significantly enhanced drug clearance is anticipated, increasing the risk of therapeutic failure. Avoid the use due to uncertain drug response and dose requirements.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	FDA

Amphetamine

General drug info:
https://new-portal.pillcheck.net/medication/C9N6

Enhanced drug clearance may lead to reduced clinical response and lower risk of side effects. Patients with genotype GG of rs510769, which is equivalent to AA in the A118G variant, was associated with significantly increased Stimulation and Euphoria scores after amphetamine.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	FDA
OPRM1	A/A	Normal sensitivity to opioids	CPIC C

Apixaban

General drug info:
https://new-portal.pillcheck.net/medication/V2R2

Significantly decreased drug metabolism is anticipated, potentially increasing drug exposure and elevated risk of bleeding. Avoid the concurrent use of CYP3A4 and P-glycoprotein inhibitors and apixaban.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

CAUTION: Do not change any medications or dosage prior to consulting your physician or pharmacist, who should determine an appropriate dose.

Aprepitant

General drug info:
https://new-portal.pillcheck.net/medication/X7Q8

Significantly reduced drug clearance is anticipated. Use alternative antiemetic if risk of drug-drug interactions is a concern. Aprepitant is a moderate CYP3A4 inhibitor and could result in elevated plasma concentrations of concomitant medications metabolized by this enzyme. Avoid concomitant use with docetaxel, irinotecan, ifosfamide, imatinib, vinblastine and vincristine.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Aripiprazole

General drug info:
https://new-portal.pillcheck.net/medication/V3X8

Potentially decreased response due to accelerated clearance; higher doses might be required to achieve a clinical effect or consider alternative treatment with drugs NOT metabolized by CYP2D6. Adjust dosage at intervals of not less than 2 weeks, the time needed to achieve steady-state concentration. Reduce aripiprazole dosage to half the dosage in patients receiving CYP3A4 or CYP2D6 inhibitors; increase aripiprazole dosage to the usual dosage after discontinuance of the CYP3A4 or CYP2D6 inhibitor. Consider increasing aripiprazole dosage upon initiation of concomitant therapy with drugs that induce CYP3A4 (carbamazepine); decrease aripiprazole dosage if the CYP3A4 inducer is discontinued.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC B

Asenapine

General drug info:
https://new-portal.pillcheck.net/medication/A3M2

Normal asenapine clearance is anticipated. Lower impact of smoking and environmental factors on asenapine clearance and response. Reduce paroxetine by half when used in combination with asenapine.

Biomarker	Value	Interpretation	Level of evidence
CYP1A2	*1A/*1A	Normal metabolizer	FDA

Atazanavir

General drug info:
https://new-portal.pillcheck.net/medication/X3W9

Normal UGT1A1 activity and very low likelihood of bilirubin-related discontinuation of atazanavir.

Biomarker	Value	Interpretation	Level of evidence
UGT1A1	*1/*1	Normal metabolizer	CPIC A

Atomoxetine

General drug info:
https://new-portal.pillcheck.net/medication/M2T2

Ultrafast metabolizers may have reduced clinical benefit for atomoxetine. Select alternative medication not metabolized by CYP2D6. If alternative medication is not possible, 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.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC A

Atorvastatin

General drug info:
https://new-portal.pillcheck.net/medication/C4P9

Prescribe ≤20mg as a starting dose and adjust doses of atorvastatin based on disease-specific guidelines. If dose >20mg is needed for desired efficacy, consider rosuvastatin or combination therapy (i.e., atorvastatin plus non-statin guideline directed medical therapy).

Biomarker	Value	Interpretation	Level of evidence
SLCO1B1	*5/*5	Poor function	CPIC A

Azathioprine

General drug info:
https://new-portal.pillcheck.net/medication/V2R4

Start with reduced starting doses (30–80% of normal dose) if the normal starting dose is 2–3 mg/kg/ day (e.g., 0.6–2.4 mg/ kg/day), and adjust doses of azathioprine based on the degree of myelosuppression and disease-specific guidelines. Allow 2–4 weeks to reach steady-state after each dose adjustment.

Biomarker	Value	Interpretation	Level of evidence
TPMT	*1/*2	Intermediate metabolizer	CPIC A

Azilsartan

General drug info:
https://new-portal.pillcheck.net/medication/N8Q9

Individuals may have significantly decreased metabolism of azilsartan by CYP2C9, which may increase exposure to this medication. Other genetic and clinical factors may also influence azilsartan metabolism and response. Consider using ARBs less dependent on CYP2C9 metabolism such as eprosartan, telmisartan or olmesartan.

Biomarker	Value	Interpretation	Level of evidence
CYP2C9	*3/*3	Poor metabolizer	FDA

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Belinostat

General drug info:
https://new-portal.pillcheck.net/medication/F9H4

Patients with an normal metabolizer genotype when treated with belinostat may have decreased risk but not absence of dose limiting toxicities. Recent publications suggest lower belinostat dose of 600mg/m2/24h. Other genetic and clinical factors may also influence adverse events associated with belinostat, as additional reduced function alleles may be prevalent in specific populations.

Biomarker	Value	Interpretation	Level of evidence
UGT1A1	*1/*1	Normal metabolizer	CPIC B

Brexpiprazole

General drug info:
https://new-portal.pillcheck.net/medication/F4F2

Dosage adjustment is recommended in CYP2D6 ultrafast metabolizers, as these patients are expected to have lower Brexpiprazole concentrations than normal metabolizers. Ultrafast CYP2D6 metabolizers should have their dosage increased carefully.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6	*1/*1	Ultrarapid metabolizer	CPIC B
CYP2D6 CNV	3N		

Brivaracetam

General drug info:
https://new-portal.pillcheck.net/medication/K4J6

Normal drug metabolism is anticipated. Standard drug dosing and monitoring apply. Other genetic and clinical factors may also influence metabolism of brivaracetam.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	CPIC B

Buprenorphine

General drug info:
https://new-portal.pillcheck.net/medication/R6N3

Poor buprenorphine clearance with a normal response to opioids is anticipated. May lead to higher buprenorphine exposure, increasing the risk of respiratory depression. Co-administration of CYP3A4 inhibitors may further increase systemic exposure and pose a risk of accidental overdose.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA
OPRM1	A/A	Normal sensitivity to opioids	CPIC C

Bupropion

General drug info:
https://new-portal.pillcheck.net/medication/K9N3

Normal clearance of bupropion and normal concentrations of hydroxybupropion, the active metabolite, are expected. Other genetic and clinical factors may also influence a patient's exposure to bupropion or hydroxybupropion.

Biomarker	Value	Interpretation	Level of evidence
CYP2B6	*1/*1	Normal metabolizer	FDA

Buspirone

General drug info:
https://new-portal.pillcheck.net/medication/P3V7

Significantly reduced buspirone clearance is anticipated. Be alert to the potentially increased risk of side effects. Avoid the use of strong CYP3A inhibitors.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Cabazitaxel

General drug info:
https://new-portal.pillcheck.net/medication/L2E8

Significantly reduced drug clearance is anticipated that will significantly increase drug exposure. Concomitant medicinal products that are strong inducers or strong inhibitors of CYP3A should be avoided. However, if patients require co-administration of a strong CYP3A inhibitor, a 25% cabazitaxel dose reduction should be considered. Dose reduction should be considered even in absence of co-administration of a CYP3A inhibitor.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	CPIC B

Caffeine

General drug info:
https://new-portal.pillcheck.net/medication/X9X9

Patients with the normal metabolizer genotype may have a decreased, but not absent, risk of non-fatal myocardial infarction with excessive coffee consumption. Pregnant women with normal caffeine metabolism who consume caffeine may have an increased likelihood of spontaneous abortion as compared to patients with reduced metabolism. Other genetic and clinical factors may also influence the likelihood of non-fatal myocardial infarction and spontaneous abortion.

Biomarker	Value	Interpretation	Level of evidence
CYP1A2	*1A/*1A	Normal metabolizer	FDA

Candesartan

General drug info:
https://new-portal.pillcheck.net/medication/J3L9

Significantly decreased metabolism of candesartan by CYP2C9 is anticipated, increasing exposure to this medication. Other genetic and clinical factors may also influence candesartan metabolism and response. Consider using ARBs less dependent on CYP2C9 metabolism such as eprosartan, telmisartan or olmesartan.

Biomarker	Value	Interpretation	Level of evidence
CYP2C9	*3/*3	Poor metabolizer	FDA

CAUTION: Do not change any medications or dosage prior to consulting your physician or pharmacist, who should determine an appropriate dose.

Cannabidiol

General drug info:
https://new-portal.pillcheck.net/medication/L4H4

Significantly reduced CBD clearance by CYP3A4 is anticipated; significantly increased risk of side effects. The recommended starting dosage is 2.5 mg/kg taken twice daily (5 mg/kg/day). Based on individual clinical response and tolerability, CBD dose can be increased. Dosage adjustment is recommended for patients with moderate or severe hepatic impairment. Because of potential inhibition of enzyme activity, consider a reduction in dosage of substrates of UGT1A9, UGT2B7, CYP2C8, CYP2C9 and CYP2C19, as clinically appropriate. Because of potential for both enzyme induction and inhibition, consider adjusting dosage of substrates of CYP1A2 and CYP2B6.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Capecitabine

General drug info:
https://new-portal.pillcheck.net/medication/H7M4

Normal DPD activity and normal risk for fluoropyrimidine toxicity

Biomarker	Value	Interpretation	Level of evidence
DPYD	*1/*1	Normal metabolizer	CPIC A

Cariprazine

General drug info:
https://new-portal.pillcheck.net/medication/Y3K4

Significantly reduced cariprazine metabolism to two active metabolites desmethyl-cariprazine (DCAR) and didesmethyl-cariprazine (DDCAR). Be alert to increased risk of side effects. Reduce cariprazine dosage by half.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Carisoprodol

General drug info:
https://new-portal.pillcheck.net/medication/F7L9

Normal metabolism of carisoprodol is anticipated; standard dosing and precautions are recommended. No change in therapy.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	CPIC B

Carvedilol

General drug info:
https://new-portal.pillcheck.net/medication/P3P4

Lower risk of dizziness; CYP2D6 inhibitors such as quinidine, fluoxetine, paroxetine, and propafenone increase carvedilol levels, while rifampin may decrease carvedilol levels.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC C

Celecoxib

General drug info:
https://new-portal.pillcheck.net/medication/E8H9

Initiate therapy with 25-50% of the lowest recommended starting dose. Titrate dose to clinical effect or 25-50% of the maximum recommended dose with caution. In accordance with the prescribing information, use the lowest effective dosage for shortest duration consistent with individual patient treatment goals. Dose titration should not occur until after steady state is reached (at least 8 days for celecoxib and 5 days for ibuprofen, flurbiprofen and lornoxicam after first dose in PMs). Carefully monitor adverse events such as blood pressure and kidney function during course of therapy. Alternatively, consider an alternate therapy not metabolized by CYP2C9.

Biomarker	Value	Interpretation	Level of evidence
CYP2C9	*3/*3	Poor metabolizer	CPIC A

Cevimeline

General drug info:
https://new-portal.pillcheck.net/medication/X2K2

Cevimeline should be administered with caution to patients taking beta adrenergic antagonists, because of the possibility of conduction disturbances. Potentially reduced clinical effect at normal doses due to accelerated drug clearance.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC C

Chlordiazepoxide and amitriptyline

General drug info:
https://new-portal.pillcheck.net/medication/F3W4

Avoid the use of amitriptyline, clomipramine, doxepin, imipramine, trimipramine due to significantly enhanced clearance and reduced response.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	CPIC A
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC A

Chlorpromazine

General drug info:
https://new-portal.pillcheck.net/medication/R3Y8

Normal drug clearance is anticipated. Coadministration with CYP1A2 inhibitors like ciprofloxacin, fluvoxamine or vemurafenib can reduce chlorpromazine clearance and hence increase exposure and potentially, adverse side effects. Smoking is expected to reduce chlorpromazine exposure requiring higher doses to achieve adequate clinical response.

Biomarker	Value	Interpretation	Level of evidence
CYP1A2	*1A/*1A	Normal metabolizer	FDA

Cilostazol

General drug info:
https://new-portal.pillcheck.net/medication/E4H3

Increased metabolism of cilostazol as compared to CYP3A5 non-expressors, possibly reducing clinical response. Variations in CYP2C19 and CYP3A4 may also influence metabolism of cilostazol. Consider discontinuation or dosage reduction for cilostazol if coadministration with CYP3A4 or CYP2C19 inhibitors, or if used in poor CYP2C19 or poor CYP3A4 metabolizers.

Biomarker	Value	Interpretation	Level of evidence
CYP3A5	*1/*3	Intermediate metabolizer	FDA

Cisplatin

General drug info:
https://new-portal.pillcheck.net/medication/V6K9

Decreased drug clearance may increase risk of cisplatin-induced ototoxicity, renal toxicity and other side effects. Consider starting with reduced cisplatin doses. Allow 2-4 weeks to reach steady state after each dose adjustment.

Biomarker	Value	Interpretation	Level of evidence
TPMT	*1/*2	Intermediate metabolizer	FDA

Citalopram

General drug info:
https://new-portal.pillcheck.net/medication/Y9T8

Normal metabolism of citalopram is anticipated; standard dosing and precautions are recommended.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	CPIC A

Clobazam

General drug info:
https://new-portal.pillcheck.net/medication/L4M2

Normal metabolism of Clobazam is anticipated; standard dosing and precautions are recommended. Titrate according to weight. If necessary and based upon clinical response, an additional titration to the maximum dose (20 mg/day or 40 mg/day, depending on the weight group) may be started on day 14.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	CPIC C

Clomipramine

General drug info:
https://new-portal.pillcheck.net/medication/A8W4

Avoid the use of amitriptyline, clomipramine, doxepin, imipramine, trimipramine due to significantly enhanced clearance and reduced response.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	CPIC A
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC A

Clonazepam

General drug info:
https://new-portal.pillcheck.net/medication/E6C2

Significantly reduced drug clearance is anticipated, increasing the risk of side effects. Estimated dose requirement for low CYP3A4 expresser patients is 0.029 mg/kg bodyweight. Co-administration of CYP3A4 inhibitors may increase drug exposure and risk of side effects.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Clopidogrel

General drug info:
https://new-portal.pillcheck.net/medication/C8W3

Normal clopidogrel active metabolite formation; normal or lower on-treatment platelet reactivity; no association with higher bleeding risk. If considering clopidogrel, use at standard dose (75 mg/day).

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	CPIC A

Clozapine

General drug info:
https://new-portal.pillcheck.net/medication/Y7W4

Clinical effect of clozapine does not appear to depend on CYP2D6 genotype. Drugs that are metabolized by CYP2D6 may inhibit the activity of this isozyme, and thus may make normal metabolizers resemble poor metabolizers. Concomitant use of clozapine with other drugs metabolized by CYP2D6 including antidepressants, phenothiazines, carbamazepine, and Type 1C antiarrhythmics (e.g., propafenone, flecainide and encainide), or that inhibit this enzyme (e.g., quinidine), may require lower doses.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC C

Codeine

General drug info:
https://new-portal.pillcheck.net/medication/Q4T8

Increased formation of morphine following codeine administration, leading to a higher risk of toxicity. Avoid codeine use due to the potential for toxicity. Alternatives that are not affected by this CYP2D6 phenotype include morphine and non-opioid analgesics. Tramadol, and to a lesser extent hydrocodone and oxycodone, are not good alternatives because their metabolism is affected by CYP2D6 activity.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC A
OPRM1	A/A	Normal sensitivity to opioids	CPIC D

Cyclosporine

General drug info:
https://new-portal.pillcheck.net/medication/L4H2

Significantly reduced clearance by CYP3A4, somewhat offset by enhanced CYP3A5 function. Be alert about potentially increased concentrations of cyclosporin and elevated risk of side effects. Consider starting at a lower dose. Use therapeutic drug monitoring to guide dose adjustments.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	CPIC C
CYP3A5	*1/*3	Intermediate metabolizer	CPIC C

Dapoxetine

General drug info:
https://new-portal.pillcheck.net/medication/F6X7

Significantly increased dapoxetine clearance is anticipated; be alert about a potentially decreased clinical response.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	Swissmedic

Darifenacin

General drug info:
https://new-portal.pillcheck.net/medication/Y3Q6

Be aware that there may be increased metabolism to less active compound, resulting in lower plasma concentrations and reduced response. There are no darifenacin dosing recommendations for ultrarapid metabolizers of CYP2D6.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	FDA

Darunavir

General drug info:
https://new-portal.pillcheck.net/medication/C8R7

Be alert to inherently decreased clearance of darunavir and ritonavir and the potentially increased risk of side effects. Co-administration of darunavir and ritonavir with drugs primarily metabolized by CYP3A may result in increased plasma concentrations and increase or prolong their therapeutic effect and adverse events.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	EMA

Desipramine

General drug info:
https://new-portal.pillcheck.net/medication/P7L6

Avoid the use of desipramine and nortriptyline due to significantly enhanced clearance and reduced response.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC A

Deutetrabenazine

General drug info:
https://new-portal.pillcheck.net/medication/M9X8

Enhanced drug clearance is anticipated potentially affecting clinical response. The starting dose is 6 mg once daily. Titrate up at weekly intervals by 6 mg per day to a tolerated dose that reduces chorea, up to a maximum recommended daily dosage of 48 mg (24 mg twice daily). Administer total daily dosages of 12 mg or above in two divided doses. A clinically relevant QT prolongation may occur in some patients treated with Deutetrabenazine when co-administered with a strong CYP2D6 inhibitor.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	FDA

Dexlansoprazole

General drug info:
https://new-portal.pillcheck.net/medication/V8Y6

Initiate standard starting daily dose. Consider increased dose by 50-100% for the treatment of H. pylori infection and erosive esophagitis. Daily dose may be given in divided doses. Monitor for efficacy.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	CPIC B

Dextroamphetamine

General drug info:
https://new-portal.pillcheck.net/medication/M6R2

Enhanced drug clearance may lead to reduced clinical response and lower risk of side effects. Patients with genotype GG of rs510769, which is equivalent to AA in the A118G variant, was associated with significantly increased Stimulation and Euphoria scores after amphetamine.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	FDA
OPRM1	A/A	Normal sensitivity to opioids	CPIC D

Dextromethorphan and promethazine

General drug info:
https://new-portal.pillcheck.net/medication/H9Q3

Enhanced dextromethorphan clearance is anticipated leading to reduced clinical response.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	FDA

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Dextromethorphan and quinidine

General drug info:
https://new-portal.pillcheck.net/medication/E2Y9

The Quinidine component of Dextromethorphan/Quinidine is intended to inhibit CYP2D6 so that higher exposure to dextromethorphan can be achieved compared to when dextromethorphan is given alone. Quinidine may have reduced contribution to the effectiveness of Dextromethorphan/Quinidine in ultrafast metabolizers.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC B

Diazepam

General drug info:
https://new-portal.pillcheck.net/medication/W7C3

Greatly reduced clearance by CYP3A4 could be somewhat offset by enhanced CYP3A5 function; be alert to increased risk of side effects and altered clinical response. Consider alternative treatment or starting therapy at a reduced dose.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	CPIC B
CYP3A4	*6/*6	Poor metabolizer	CPIC C
CYP3A5	*1/*3	Intermediate metabolizer	CPIC C

Diclofenac

General drug info:
https://new-portal.pillcheck.net/medication/W2M4

Significantly reduced drug clearance is anticipated. Significantly increased risk of GI bleeding and other side effects, requiring reduced doses or alternative treatment. Celecoxib and other NSAIDs are also affected.

Biomarker	Value	Interpretation	Level of evidence
CYP2C9	*3/*3	Poor metabolizer	CPIC C

Dolasetron

General drug info:
https://new-portal.pillcheck.net/medication/V3N7

Enhanced CYP2D6 metabolism of the active metabolite, hydrodolasetron, may decrease response. The decreased response could lead to a higher risk of vomiting after chemotherapy or anesthesia. No significant associations have been observed for nausea. Select an alternative drug less dependent of CYP2D6 metabolism (i.e. granisetron).

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC C

Dolutegravir

General drug info:
https://new-portal.pillcheck.net/medication/H6W9

Subject expected to show normal oral clearance. Other genetic and clinical factors may affect oral clearance of dolutegravir.

Biomarker	Value	Interpretation	Level of evidence
UGT1A1	*1/*1	Normal metabolizer	CPIC B

Donepezil

General drug info:
https://new-portal.pillcheck.net/medication/T3W7

Significantly enhanced drug clearance is expected based on the CYP2D6 metabolic status, leading to 24% faster clearance. Be alert to lack of efficacy and side effects. Population pharmacokinetic analysis showed that in the presence of concomitant CYP2D6 inhibitors, donepezil AUC was increased by approximately 17% to 20% in patients with Alzheimer's Disease taking donepezil 10 and 23 mg.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6	*1/*1	Ultrarapid metabolizer	CPIC B
CYP2D6 CNV	3N		

Doxepin

General drug info:
https://new-portal.pillcheck.net/medication/F4N6

Avoid the use of amitriptyline, clomipramine, doxepin, imipramine, trimipramine due to significantly enhanced clearance and reduced response.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	CPIC A
CYP2D6	*1/*1	Ultrarapid metabolizer	CPIC A
CYP2D6 CNV	3N		

Dronabinol

General drug info:
https://new-portal.pillcheck.net/medication/Y9C8

Poor drug clearance. Published data indicate a 2- to 3-fold higher dronabinol exposure in individuals carrying genetic variants associated with diminished CYP2C9 function. Monitor for increased dronabinol-related adverse reactions when it is co-administered with inhibitors of CYP2C9 and CYP3A4 enzymes.

Biomarker	Value	Interpretation	Level of evidence
CYP2C9	*3/*3	Poor metabolizer	FDA

Dronedarone

General drug info:
https://new-portal.pillcheck.net/medication/A2X2

Significantly reduced drug clearance is anticipated leading to high risk of QT interval prolongation and induction of Torsade de Pointes. Dronedarone can further increase propranolol and metoprolol exposure. Other CYP2D6 substrates, including other beta blockers, tricyclic antidepressants, and SSRIs may have increased exposure upon co-administration with dronedarone.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Duloxetine

General drug info:
https://new-portal.pillcheck.net/medication/H8H7

Significantly enhanced duloxetine clearance by CYP2D6 is anticipated, affecting clinical response. Both CYP1A2 and CYP2D6 are responsible for Duloxetine metabolism. Inhibition of CYP1A2 or CYP2D6 may significantly increase drug exposure. Avoid coadministration of duloxetine with CYP2D6 inhibitors or CYP1A2 inhibitors including orcimetidine, ciprofloxacin, enoxacin, and fluvoxamine. Among CYP1A2 inducers, smoking is probably the most important, but the usual enzyme inducers such as rifampin and barbiturates can also substantially increase CYP1A2 activity and affect response to duloxetine.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC C

Efavirenz

General drug info:
https://new-portal.pillcheck.net/medication/W9C6

Reduced risk for Efavirenz induced CNS toxicity. Efavirenz enhances the clearance of coadministered drugs metabolized by CYP3A4. This induction is most pronounced in extensive metabolizers requiring a dose adjustment. Dose optimization by Metabolic Status and weight is critical.

Biomarker	Value	Interpretation	Level of evidence
CYP2B6	*1/*1	Normal metabolizer	CPIC A

Elagolix

General drug info:
https://new-portal.pillcheck.net/medication/L7L3

Possible decreased clearance of elagolix, which may lead to increased blood levels and increased risk of side effects. Check metabolizer status for CYP3A4 which may also influence elagolix clearance. Avoid use in women with moderate hepatic impairment and severe hepatic impairment due to increased risk of increased liver enzymes. Avoid concomitant use of strong organic anion transporting polypeptide (OATP) 1B1 inhibitors (cyclosporine, gemfibrozil) and strong CYP3A4 inhibitors.

Biomarker	Value	Interpretation	Level of evidence
SLCO1B1	*5/*5	Poor function	FDA

Eletriptan

General drug info:
https://new-portal.pillcheck.net/medication/A6A6

Significantly reduced eletriptan clearance is anticipated increasing the risk of side effects.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Eliglustat

General drug info:
https://new-portal.pillcheck.net/medication/V8A4

Eliglustat should not be used in patients who are CYP2D6 ultra-rapid metabolizers as they may not achieve adequate concentrations of eliglustat to achieve a therapeutic effect.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC B

Enzalutamide

General drug info:
https://new-portal.pillcheck.net/medication/V7A2

Rare diplotype of unknown clinical significance. Assess enzatumaide and N-desmethyl enzalutamide levels. Avoid strong CYP2C8 inhibitors, as they can increase the plasma exposure. If co-administration is necessary, reduce enzalutamide dose. Enzalutamide is a strong inducer of CYP3A4. Avoid strong or moderate CYP3A4 or CYP2C8 inducers as they can alter the plasma exposure.

Biomarker	Value	Interpretation	Level of evidence
CYP2C8	*4/*4	Unknown metabolizer	FDA

Erdafitinib

General drug info:
https://new-portal.pillcheck.net/medication/A3K7

Erdafitinib plasma concentrations were predicted to be higher in patients with the CYP2C9*3/*3 genotype. Monitor for increased adverse reactions. Avoid the use of CYP3A4 inhibitors or substrates.

Biomarker	Value	Interpretation	Level of evidence
CYP2C9	*3/*3	Poor metabolizer	CPIC B

Erlotinib

General drug info:
https://new-portal.pillcheck.net/medication/Y7K6

Erlotinib is a strong inhibitor of glucuronidation by UGT1A1. The inhibition of glucuronidation may cause interactions with medicinal products which are substrates of UGT1A1 and exclusively cleared by this pathway.

Biomarker	Value	Interpretation	Level of evidence
UGT1A1	*1/*1	Normal metabolizer	FDA

Escitalopram

General drug info:
https://new-portal.pillcheck.net/medication/P7K8

Normal drug clearance is anticipated.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	CPIC A

Esomeprazole

General drug info:
https://new-portal.pillcheck.net/medication/A8J7

Normal drug response is anticipated. Rabeprazole and esomeprazole are less affected by CYP2C19 variation than omeprazole, pantoprazole and other first generation PPIs.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	CPIC C

Eszopiclone

General drug info:
https://new-portal.pillcheck.net/medication/X8M8

Significantly reduced clearance is anticipated, increasing exposure to eszopiclone and the risk of side effects risk. Consider dose reduction or alternative medication not metabolized by CYP3A4. In elderly patients the starting dose of eszopiclone should be further decreased, as well as in patients with impaired liver function.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Everolimus

General drug info:
https://new-portal.pillcheck.net/medication/E7J9

Possibly reduced everolimus clearance by CYP3A4 may lead to higher everolimus exposure and a higher risk of side effects. Consider dose reduction as per drug label for CYP3A4 inhibitors: for Breast Cancer, NET, and TSC-Associated Renal Angiomyolipoma - Reduce dose to 2.5 mg once daily. The dose may be increased to 5 mg once daily if tolerated. For TSC-Associated SEGA and TSC-Associated Partial-Onset Seizures: reduce the daily dose by 50%, 5 mg/m2 orally once daily, and adjust the dose to attain trough concentrations of 5-15 ng/mL. Monitor for signs of side effects. Avoid the use of P-gp and ACE inhibitors.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA
CYP3A5	*1/*3	Intermediate metabolizer	FDA

Evolocumab

General drug info:
https://new-portal.pillcheck.net/medication/M2W4

The variation you carry in the SLCO1B1 gene indicates that you have a high myopathy risk and will be statin-intolerant. Consider treatment with PCSK9 inhibitors.

Biomarker	Value	Interpretation	Level of evidence
SLCO1B1	*5/*5	Poor function	FDA

Fenofibrate / simvastatin

General drug info:
https://new-portal.pillcheck.net/medication/L6Q7

High risk for developing simvastatin-induced myopathy. Prescribe an alternative statin depending on the desired potency.

Biomarker	Value	Interpretation	Level of evidence
SLCO1B1	*5/*5	Poor function	CPIC A

Fentanyl

General drug info:
https://new-portal.pillcheck.net/medication/R2J2

Individuals with the AA genotype may experience increased efficacy of opioids for pain management, may be less susceptible to opioid addiction, and may require a decreased dose of opioids as compared to individuals with the GG genotype. However, this has been contradicted in some studies. Other genetic and clinical factors may also influence a patient's response to opioid drugs.

Biomarker	Value	Interpretation	Level of evidence
OPRM1	A/A	Normal sensitivity to opioids	CPIC C

Fesoterodine

General drug info:
https://new-portal.pillcheck.net/medication/Y7E9

Be aware of lower plasma fesoterodine concentrations and reduced response. There are no fesoterodine dosing recommendations for ultrarapid metabolizers of CYP2D6.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC C

Flecainide

General drug info:
https://new-portal.pillcheck.net/medication/E8H2

Record ECG and monitor plasma concentration or select alternative drug e.g., sotalol, disopyramide, quinidine, amiodarone.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC C

Flibanserin

General drug info:
https://new-portal.pillcheck.net/medication/K9K4

Normal drug clearance by CYP2C19 is anticipated. Flibanserin is also metabolized by CYP3A4, CYP2D6 and CYP2C9. Poor metabolizers of CYP2D6 and poor CYP2C9 metabolizers may have slightly decreased drug exposure. Severe hypotension and syncope can occur when Flibanserin is used with moderate or strong CYP3A4 inhibitors or in patients with hepatic impairment; therefore, Flibanserin use in these settings is contraindicated. Risk of hypotension is elevated for women with reduced CYP3A4 function.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	CPIC C

Flucytosine

General drug info:
https://new-portal.pillcheck.net/medication/W8E2

Normal clearance of flucytosine metabolite 5-fluorouracil is anticipated. Monitor for signs of drug toxicity or side effects.

Biomarker	Value	Interpretation	Level of evidence
DPYD	*1/*1	Normal metabolizer	FDA

Fluindione

General drug info:
https://new-portal.pillcheck.net/medication/J2L9

A significantly enhanced response to fluindione is anticipated. Pharmacokinetic studies identified this genotype as an average daily dose of fluindione of 8.2 mg (±2.5).

Biomarker	Value	Interpretation	Level of evidence
VKORC1	T/T	Low Vitamin K production	EMA

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Fluorouracil

General drug info:
https://new-portal.pillcheck.net/medication/E3F3

Normal metabolism of Fluorouracil is anticipated; standard dosing and precautions are recommended. Note that there is a normal risk of unanticipated myelosuppression, arrhythmia and death.

Biomarker	Value	Interpretation	Level of evidence
DPYD	*1/*1	Normal metabolizer	CPIC A

Fluoxetine

General drug info:
https://new-portal.pillcheck.net/medication/Q9J7

Enhanced drug clearance may affect clinical response at regular doses. Fluoxetine inhibits CYP2D6 and may make individuals with normal CYP2D6 activity resemble a poor metabolizer. Coadministration of fluoxetine with drugs that are metabolized by CYP2D6 (TCAs, phenothiazines and atypicals), and antiarrhythmics (propafenone, flecainide) should be approached with caution. Drugs metabolized by the CYP2D6 should be initiated at the low end of the dose range if a patient is receiving fluoxetine or has taken it in the previous 5 weeks - dosing requirements as for poor metabolizers. If fluoxetine is added to a drug metabolized by CYP2D6 decrease dose of the original medication.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6	*1/*1	Ultrarapid metabolizer	CPIC C
CYP2D6 CNV	3N		

Fluoxetine and olanzapine

General drug info:
https://new-portal.pillcheck.net/medication/H6W7

Potentially reduced clinical response due to enhanced fluoxentine clearance. Fluoxetine inhibits CYP2D6 and may make individuals with normal CYP2D6 activity resemble a poor metabolizer. Coadministration of fluoxetine with other drugs that are metabolized by CYP2D6 (TCAs, phenothiazines and most atypicals, antiarrhythmics) should be approached with caution. Therapy with drugs metabolized by the CYP2D6 system should be initiated at the low end of the dose range if a patient is receiving fluoxetine or has taken it in the previous 5 weeks. If fluoxetine is added to the treatment regimen of a patient already receiving a drug metabolized by CYP2D6 (including but not limited to, flecainide, propafenone, vinblastine, and TCAs), the need for a decreased dose of the original medication should be considered. Agents inducing CYP1A2 or glucuronyl transferase enzymes (omeprazole, rifampin) may cause an increase in olanzapine clearance.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6	*1/*1	Ultrarapid metabolizer	CPIC C
CYP2D6 CNV	3N		

Flupentixol

General drug info:
https://new-portal.pillcheck.net/medication/E9A6

Potentially enhanced flupentixol clearance is anticipated. Flupentixol metabolism is less affected compared to risperidone, aripiprazole and other antipsychotics impacted by CYP2D6 metabolism.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6	*1/*1	Ultrarapid metabolizer	FDA
CYP2D6 CNV	3N		

Fluphenazine

General drug info:
https://new-portal.pillcheck.net/medication/H3V6

Normal fluphenazine clearance is anticipated.

Biomarker	Value	Interpretation	Level of evidence
CYP1A2	*1A/*1A	Normal metabolizer	FDA

Flurbiprofen

General drug info:
https://new-portal.pillcheck.net/medication/A9K7

Initiate therapy with 25-50% of the lowest recommended starting dose. Titrate dose to clinical effect or 25-50% of the maximum recommended dose with caution. In accordance with the prescribing information, use the lowest effective dosage for shortest duration consistent with individual patient treatment goals. Dose titration should not occur until after steady state is reached (at least 8 days for celecoxib and 5 days for ibuprofen, flurbiprofen and lornoxicam after first dose in PMs). Carefully monitor adverse events such as blood pressure and kidney function during course of therapy. Alternatively, consider an alternate therapy not metabolized by CYP2C9.

Biomarker	Value	Interpretation	Level of evidence
CYP2C9	*3/*3	Poor metabolizer	CPIC B

Fluvastatin

General drug info:
https://new-portal.pillcheck.net/medication/A7Q9

Greatly reduced fluvastatin transport and metabolism. Prescribe an alternative statin depending on the desired potency.

Biomarker	Value	Interpretation	Level of evidence
CYP2C9	*3/*3	Poor metabolizer	CPIC A
SLCO1B1	*5/*5	Poor function	CPIC A

Fluvoxamine

General drug info:
https://new-portal.pillcheck.net/medication/K8P3

Enhanced metabolism. Lower plasma concentraiton may decrease clinical effect due to enhanced drug clearance. Fluvoxamine inhibits the CYP1A2, 2C9, 3A4, 2C19 isozymes and affects metabolism of multiple drugs including Warfarin, Alprazolam, Omeprazole, Theophyllin and many other medications.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC B

Fosamprenavir

General drug info:
https://new-portal.pillcheck.net/medication/Q9H4

Significantly reduced drug clearance is anticipated, affecting total exposure and increasing risk of side effects. Consider alternative treatment.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Fosaprepitant

General drug info:
https://new-portal.pillcheck.net/medication/X2T9

Fosaprepitant is a prodrug that is rapidly converted by numerous organs to its active metabolite, aprepitant. Significantly reduced aprepitant clearance is anticipated. Use alternative antiemetic due to risk of drug-drug interactions. Aprepitant is a moderate CYP3A4 inhibitor and could result in elevated plasma concentrations of concomitant medications metabolized by this enzyme. Avoid concomitant use with docetaxel, irinotecan, ifosfamide, imatinib, vinblastine and vincristine.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Fosphenytoin

General drug info:
https://new-portal.pillcheck.net/medication/R7T3

Significantly reduced metabolism of phenytoin, the active metabolite of fosphenytoin. Higher plasma concentrations will increase the probability of toxicities. Consider a 50% reduction of the recommended starting maintenance dose. Subsequent doses should be adjusted according to therapeutic drug monitoring and response. Patients of Chinese ancestry have found a strong association between the risk of developing SJS/TEN and the presence of HLA-B*1502.

Biomarker	Value	Interpretation	Level of evidence
CYP2C9	*3/*3	Poor metabolizer	CPIC A

Galantamine

General drug info:
https://new-portal.pillcheck.net/medication/C2V3

CYP2D6 and CYP3A4 are major enzymes needed for galantamine metabolism. Enhanced drug clearance may reduce clinical effect. The dose of drug is individually titrated to tolerability.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC C

Gefitinib

General drug info:
https://new-portal.pillcheck.net/medication/T6M4

Be alert about potentially increased gefitinib clearance by CYP2D6 and higher O-desmethyl gefitinib levels that may affect clinical response. Increase the gefitinib dose to 500 mg daily in patients receiving a strong CYP3A4 inducer. Monitor patients for signs of side effects if concomitant use of CYP3A4 inhibitor.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	FDA

Guanfacine

General drug info:
https://new-portal.pillcheck.net/medication/H8M6

Significantly reduced drug clearance is anticipated. Consider alternative treatment due to significantly increased exposure. When discontinuing, taper the dose in decrements of no more than 1 mg every 3 to 7 days.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Haloperidol

General drug info:
https://new-portal.pillcheck.net/medication/P7A6

Be alert to decreased haloperidol plasma concentration. Use 1.5 times the normal dose or choose an alternative. Antipsychotics that are not metabolized by CYP2D6 - or to a much lesser extent - include, for example, flupentixol, penfluridol, quetiapine, olanzapine or clozapine.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC C

Hydrocodone

General drug info:
https://new-portal.pillcheck.net/medication/K8M2

Increased formation of hydromorphone formation following hydrocodone administration, leading to a higher risk of toxicity. Tramadol, oxycodone are not good alternatives because their metabolism is affected by CYP2D6 activity.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	FDA
OPRM1	A/A	Normal sensitivity to opioids	CPIC C

Hydromorphone

General drug info:
https://new-portal.pillcheck.net/medication/K2Y6

Hydromorphone is not metabolized by CYP2D6 and can be prescribed to patients with altered CYP2D6 metabolism. Individuals with the AA genotype may experience increased efficacy of opioids for pain management, may be less susceptible to opioid addiction, and may require a decreased dose of opioids as compared to individuals with the GG genotype. However, this has been contradicted in some studies. Other genetic and clinical factors may also influence a patient's response to opioid drugs.

Biomarker	Value	Interpretation	Level of evidence
OPRM1	A/A	Normal sensitivity to opioids	CPIC C

Ibuprofen

General drug info:
https://new-portal.pillcheck.net/medication/A8F9

Initiate therapy with 25-50% of the lowest recommended starting dose. Titrate dose to clinical effect or 25-50% of the maximum recommended dose with caution. In accordance with the prescribing information, use the lowest effective dosage for shortest duration consistent with individual patient treatment goals. Dose titration should not occur until after steady state is reached (at least 8 days for celecoxib and 5 days for ibuprofen, flurbiprofen and lornoxicam after first dose in PMs). Carefully monitor adverse events such as blood pressure and kidney function during course of therapy. Alternatively, consider an alternate therapy not metabolized by CYP2C9.

Biomarker	Value	Interpretation	Level of evidence
CYP2C9	*3/*3	Poor metabolizer	CPIC A

Iloperidone

General drug info:
https://new-portal.pillcheck.net/medication/A2E6

CYP2D6 and CYP3A4 are the major enzymes needed for Iloperidone metabolism. Potentially reduced clinical response due to enhanced drug clearance. Dose adjustment may be required.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6	*1/*1	Ultrarapid metabolizer	CPIC B
CYP2D6 CNV	3N		

Imipramine

General drug info:
https://new-portal.pillcheck.net/medication/J8K7

Avoid the use of amitriptyline, clomipramine, doxepin, imipramine, trimipramine due to significantly enhanced clearance and reduced response.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	CPIC A
CYP2D6	*1/*1	Ultrarapid metabolizer	CPIC A
CYP2D6 CNV	3N		

Indacaterol

General drug info:
https://new-portal.pillcheck.net/medication/E3J6

Normal drug clearance. Steady-state AUC and Cmax of indacaterol were 1.2-fold higher in the (TA)/(TA)7 genotype, suggesting no relevant effect of UGT1A1 genotype on indacaterol exposure.

Biomarker	Value	Interpretation	Level of evidence
UGT1A1	*1/*1	Normal metabolizer	FDA

Irbesartan

General drug info:
https://new-portal.pillcheck.net/medication/K4P8

Individuals with poor CYP2C9 metabolism may have significantly decreased clearance of Irbesartan, which may result in increased exposure as compared to patients with normal metabolism, resulting in greater reduction in blood pressure. Other clinical and genetic factors may also influence the metabolism of Irbesartan. Excessive exposure to the medication can also increase the risk of side effects.

Biomarker	Value	Interpretation	Level of evidence
CYP2C9	*3/*3	Poor metabolizer	FDA

Irinotecan

General drug info:
https://new-portal.pillcheck.net/medication/P4R3

Irinotecan frequently causes diarrhea and myelosuppression. Normal metabolism anticipated. Start with with normal drug doses according to formulations: Irinotecan (Camptosar) single agent dose of 350 mg/m2 IV infusion for 90 minutes every 3 weeks. Irinotecan FOLFIRI (with or without bevacizumab) or FOLFIRINOX (with or without cetuximab) 180 mg/m2 IV infusion for 90 minutes every 2 weeks. Irinotecan FOLFOXIRI (with or without cetuximab or bevacizumab) 165 mg/m2 IV infusion for 60 minutes every 2 weeks. Irinotecan liposome with 5-FU and leucovorin 70 mg/m2 IV infusion for 90 minutes Every 2 weeks. Sacituzumab Govitecan-hziy (Trodelvy) 10 mg/kg IV infusion for 3 hours for the first infusion; days 1 and 8 of each 21-day cycle.

Biomarker	Value	Interpretation	Level of evidence
UGT1A1	*1/*1	Normal metabolizer	CPIC A

Itraconazole

General drug info:
https://new-portal.pillcheck.net/medication/P3L9

Significantly reduced drug clearance is anticipated, significantly increasing the plasma concentrations of drugs metabolized by CYP3A4 including itraconazole. Avoid concomitant use of cisapride, pimozide, levacetylmethadol and quinidine with itraconazole due to serious risk of significant cardiovascular events, including QT prolongation, torsades de pointes, ventricular tachycardia, cardiac arrest, and/or sudden death.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Ivabradine

General drug info:
https://new-portal.pillcheck.net/medication/K4J7

Be aware of inherently reduced ivabradine clearance and increased risk of side effects. Monitor patients for atrial fibrillation and bradycardia symptoms during treatment.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	EMA

Ketamine

General drug info:
https://new-portal.pillcheck.net/medication/X9C7

Normal drug clearance anticipated. Average risk of side effects including drowsiness, hallucinations, dizziness and confusion. Use of ketamine is associated with emergence phenomena outcome characterized by vivid dreams, euphoria, illusions, delirium, and hallucinations, schizophrenia-like symptoms, or as a floating sensation.

Biomarker	Value	Interpretation	Level of evidence
CYP2B6	*1/*1	Normal metabolizer	FDA

Labetalol

General drug info:
https://new-portal.pillcheck.net/medication/Q3J9

Normal labetalol clearance is anticipated.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	FDA

Lacosamide

General drug info:
https://new-portal.pillcheck.net/medication/F6N3

Normal plasma concentrations of the lacosamide O-desmethyl metabolite is expected. As lacosamide is also metabolized by CYP2C9, poor metabolizers of CYP2C9 might have increased exposure to lacosamide.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	FDA

Lansoprazole

General drug info:
https://new-portal.pillcheck.net/medication/Y3H9

Initiate standard starting daily dose. Consider increased dose by 50-100% for the treatment of H. pylori infection and erosive esophagitis. Daily dose may be given in divided doses. Monitor for efficacy.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	CPIC B

Leflunomide

General drug info:
https://new-portal.pillcheck.net/medication/T2F7

Normal leflunomide clearance by CYP2C19 is anticipated. Check CYP3A4 metabolic status; avoid the use of strong CYP3A4 inhibitors. The maximum recommended daily dosage is 20 mg once per day.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	FDA

Lesinurad

General drug info:
https://new-portal.pillcheck.net/medication/C8J9

Lesinurad exposure is increased in CYP2C9 poor metabolizers. At the 400 mg dose, lesinurad exposure was approximately 1.8-fold higher in CYP2C9 poor metabolizers compared to CYP2C9 extensive metabolizers. Lesinurad should be used with caution in patients who are CYP2C9 poor metabolizers.

Biomarker	Value	Interpretation	Level of evidence
CYP2C9	*3/*3	Poor metabolizer	CPIC C

Levomilnacipran

General drug info:
https://new-portal.pillcheck.net/medication/X3K6

Be alert to significantly decreased clearance of milnacipran and levomilnacipran. Be alert to the potentially increased risk of side effects. As per the recommendation for co-administration of strong CYP3A4 inhibitors such as ketoconazole, do not exceed levomilnacipran 80 mg once daily; a corresponding dose reduction of milnacipran should be considered.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Lofexidine

General drug info:
https://new-portal.pillcheck.net/medication/F9T9

Significantly enhanced drug clearance is anticipated, decreasing the risk of side effects and potentially reducing clinical response. Concomitant use of CYP2D6 inhibitors may increase lofexidine exposure. Concomitant use of methadone with lofexidine may prolong QT interval and ECG monitoring is recommended. Concomitant use of naltrexone with lofexidine may reduce naltrexone efficacy.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6	*1/*1	Ultrarapid metabolizer	FDA
CYP2D6 CNV	3N		

Lornoxicam

General drug info:
https://new-portal.pillcheck.net/medication/C3F3

Initiate therapy with 25-50% of the lowest recommended starting dose. Titrate dose to clinical effect or 25-50% of the maximum recommended dose with caution. In accordance with the prescribing information, use the lowest effective dosage for shortest duration consistent with individual patient treatment goals. Dose titration should not occur until after steady state is reached (at least 8 days for celecoxib and 5 days for ibuprofen, flurbiprofen and lornoxicam after first dose in PMs). Carefully monitor adverse events such as blood pressure and kidney function during course of therapy. Alternatively, consider an alternate therapy not metabolized by CYP2C9.

Biomarker	Value	Interpretation	Level of evidence
CYP2C9	*3/*3	Poor metabolizer	CPIC A

Losartan

General drug info:
https://new-portal.pillcheck.net/medication/A3N9

Individuals may have significantly decreased metabolism of Losartan, as indicated by decreased plasma concentration of the active metabolite, E-3174. Subjects may show significantly higher Losartan/E3174 metabolic ratios, which may result in significantly reduced clinical response to this medication. Other genetic and clinical factors may also influence Losartan metabolism and response.

Biomarker	Value	Interpretation	Level of evidence
CYP2C9	*3/*3	Poor metabolizer	FDA

Lovastatin

General drug info:
https://new-portal.pillcheck.net/medication/Y2H6

High risk of myopathy. Prescribe an alternative statin depending on the desired potency.

Biomarker	Value	Interpretation	Level of evidence
SLCO1B1	*5/*5	Poor function	CPIC A

Loxapine

General drug info:
https://new-portal.pillcheck.net/medication/N3A2

Normal metabolism of loxapine to active metabolites amoxapine, 8-Hydroxyloxapine and 7-Hydroxyloxapine is anticipated. Formation of 7-Hydroxyloxapine is also mediated by CYP2D6; dose adjustments might be warranted if stong CYP2D6 or CYP3A4 inhibitors are used along with loxapine.

Biomarker	Value	Interpretation	Level of evidence
CYP1A2	*1A/*1A	Normal metabolizer	FDA

Lurasidone

General drug info:
https://new-portal.pillcheck.net/medication/K3Y8

Significantly reduced drug metabolism is anticipated will affect clinical response and risk of side effects. Lurasidone is metabolized mainly via CYP3A4 into two active metabolites (ID-14283 and ID-14326) and two major non-active metabolites (ID-20219 and ID-20220). Avoid coadministration with a strong CYP3A4 inhibitor (e.g., ketoconazole) and inducer (e.g., rifampicin). Dose adjustment is recommended for moderate CYP3A4 inhibitors (e.g. diltiazem).

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Maprotiline

General drug info:
https://new-portal.pillcheck.net/medication/M2F3

Significantly increased maprotiline clearance is anticipated, leading to reduced clinical response.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	FDA

Maraviroc

General drug info:
https://new-portal.pillcheck.net/medication/V4K7

Increased maraviroc clearance by CYP3A5 is anticipated. Check CYP3A4 metabolic status to assess maraviroc daily dose requirements. Consider dose reduction if use of potent CYP3A inhibitors is needed. Increase dose to 600mg/day if using potent CYP3A inducers such as efavirenz, rifampin, etravirine, carbamazepine, phenobarbital, and phenytoin.

Biomarker	Value	Interpretation	Level of evidence
CYP3A5	*1/*3	Intermediate metabolizer	FDA

Mavacamten

General drug info:
https://new-portal.pillcheck.net/medication/W8X4

Significantly reduced clearance by CYP3A4 is anticipated; be alert about significantly increased risk of side effect and/or altered response. Consider alternative treatment or dose reduction as per drug label recommendations for CYP3A4 or CYP2C19 inhibitors: for in patients who are on stable therapy with a weak CYP2C19 inhibitor or a moderate CYP3A4 inhibitor initiate mavacamten at the recommended starting dosage of 5 mg orally once daily. Reduce dosage of mavacamten by one level (i.e., 15 to 10 mg; 10 to 5 mg; or 5 to 2.5 mg). Clinical and echocardiographic assessment 4-12 weeks is required. Avoid initiation of concomitant weak CYP2C19 and moderate CYP3A4 inhibitors in patients on stable treatment with 2.5 mg of mavacamten because a lower dose is not available.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	FDA
CYP3A4	*6/*6	Poor metabolizer	FDA

Meclizine

General drug info:
https://new-portal.pillcheck.net/medication/A6Y2

Significantly enhanced drug clearance is anticipated, which may lead to decreased clinical response. Similarly, ondansetron will also result in a decreased response as compared to other metabolizer groups. The decreased response could lead to a higher risk of vomiting after chemotherapy or anesthesia. Select an alternative drug not predominantly metabolized by CYP2D6 (i.e. granisetron).

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	FDA

Meloxicam

General drug info:
https://new-portal.pillcheck.net/medication/A9E4

Choose an alternative therapy not metabolized by CYP2C9 or not significantly impacted by CYP2C9 genetic variants in vivo or choose an NSAID metabolized by CYP2C9 but with a shorter half-life (such as celecoxib, fluriprofen, lornoxicam, and ibuprofen).

Biomarker	Value	Interpretation	Level of evidence
CYP2C9	*3/*3	Poor metabolizer	CPIC A

Mercaptopurine

General drug info:
https://new-portal.pillcheck.net/medication/Y9R6

Start with reduced starting Strong doses (30–80% of a normal dose) if the normal starting dose is ≥ 75 mg/m2/day or ≥ 1.5 mg/kg/day (e.g., start at 22.5–60 mg/m2/ day or 0.45–1.2 mg/kg/ day) and adjust doses of mercaptopurine based on the degree of myelosuppression and disease-specific guidelines. Allow 2–4 weeks to reach steady-state after each dose adjustment. If myelosuppression occurs and depending on other therapy, emphasis should be on reducing mercaptopurine over other agents. If normal starting dose is already < 75 mg/m2/day or < 1.5 mg/kg/day, dose reduction may not be recommended. The functional status of NUDT15 could not be determined, hence its contribution to further dose adjustments is unknown.

Biomarker	Value	Interpretation	Level of evidence
TPMT	*1/*2	Intermediate metabolizer	CPIC A

Methadone

General drug info:
https://new-portal.pillcheck.net/medication/Q2M6

Clinical response to methadone is strongly related to prior use. Multiple doses versus single dose, body weight, history of cocaine dependence and ethnicity (Asian>Caucasian>African) were independently associated with methadone dose in multiple regression analysis.

Biomarker	Value	Interpretation	Level of evidence
CYP2B6	*1/*1	Normal metabolizer	CPIC B
OPRM1	A/A	Normal sensitivity to opioids	CPIC C

Methotrexate

General drug info:
https://new-portal.pillcheck.net/medication/Y4V3

Significantly reduced drug clearance by OATP1B1 transporter is anticipated. Substantially increased risk of methotrexate toxicity. Assess variations in MTHFR and MTRR; adjust dosage accordingly.

Biomarker	Value	Interpretation	Level of evidence
SLCO1B1	*5/*5	Poor function	CPIC C

Metoclopramide

General drug info:
https://new-portal.pillcheck.net/medication/E8V7

Increased drug clearance is anticipated, potentially affecting clinical response. The recommended adult dosage is 10 to 15 mg four times daily for 4 to 12 weeks; in Europe the recommended maximal dose is 30mg up to 5 days. Administer the dose thirty minutes before each meal and at bedtime.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	FDA

Metoprolol

General drug info:
https://new-portal.pillcheck.net/medication/W2V2

Increased metabolism of metoprolol leading to decreased drug concentrations; however, it is unclear whether this results in clinically significant changes in HR, BP, or clinical outcome. Caution should be exercised when coadministering potent CYP2D6 inhibitors such as fluoxetine, paroxetine or bupropion, antipsychotics, antiarrhythmics, antiretrovirals, antihistamines, antimalarials, antifungals and cimetidine.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC A

Mexiletine

General drug info:
https://new-portal.pillcheck.net/medication/M3R4

Significantly increased mexiletine clearance is anticipated, affecting clinical efficacy. Coadministration of fluvoxamine, an inhibitor of CYP1A2 and CYP2D6 substrate decreased mexiletine clearance, making normal CYP2D6 metabolizers resemble poor metabolizers. Smoking is expected to further increase mexiletine clearance.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	FDA

Midazolam

General drug info:
https://new-portal.pillcheck.net/medication/W4Y4

Significantly reduced clearance by CYP3A4 might be somewhat offset by increased clearance by CYP3A5. Be alert to potentially altered clinical response and signs of side effects. Other clinical and genetic factors may also influence the clearance and metabolism of alprazolam, midazolam and triazolam.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA
CYP3A5	*1/*3	Intermediate metabolizer	FDA

Milnacipran

General drug info:
https://new-portal.pillcheck.net/medication/J7L9

Be alert to significantly decreased clearance of milnacipran and levomilnacipran. Be alert to the potentially increased risk of side effects. As per the recommendation for co-administration of strong CYP3A4 inhibitors such as ketoconazole, do not exceed levomilnacipran 80 mg once daily; a corresponding dose reduction of milnacipran should be considered.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Mirabegron

General drug info:
https://new-portal.pillcheck.net/medication/L2Q7

Enhanced drug clearance is anticipated, potentially leading to reduced clinical response. Blood pressure monitoring is recommended. Mirabegron is not recommended for patients with uncontrolled hypertension.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	FDA

Mirtazapine

General drug info:
https://new-portal.pillcheck.net/medication/A3C2

Enhanced drug clearance is anticipated. Increased metabolism is associated with decreased response to mirtazapine in people with Mood Disorders. Other genetic and clinical factors may also influence a patient's metabolism of mirtazapine

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	FDA

Moclobemide

General drug info:
https://new-portal.pillcheck.net/medication/N4V3

Normal moclobemide clearance is anticipated. Note that moclobemide is a potent inhibitor of the CYP2C19 enzyme, affecting the clearance of mephenytoin and other drugs metabolized by this enzyme. Consider dose adjustment for these drugs when coadministered with moclobemide.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	Swissmedic

Modafinil

General drug info:
https://new-portal.pillcheck.net/medication/P9X9

Significantly enhanced drug metabolism; select alternative treatment. In tricyclic-treated patients, particularly Ultrafast CYP2D6 Metabolizers, the amount of metabolism by CYP2C19 may be substantially decreased. Modafinil may cause elevation of the levels of the tricyclics in this subset of patients. Do not use Modafinil in patients with reduced CYP2C19 or 2D6 metabolism.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC C

Morphine

General drug info:
https://new-portal.pillcheck.net/medication/H7J3

Individuals with the AA genotype may experience increased efficacy of opioids for pain management, may be less susceptible to opioid addiction, and may require a decreased dose of opioids as compared to individuals with the GG genotype. However, this has been contradicted in some studies. Other genetic and clinical factors may also influence a patient's response to opioid drugs.

Biomarker	Value	Interpretation	Level of evidence
OPRM1	A/A	Normal sensitivity to opioids	CPIC C

Nabumetone

General drug info:
https://new-portal.pillcheck.net/medication/A2C8

Normal nabumetone biotransformation into active metabolite 6-MNA is anticipated, leading to potentially reduced clinical response.

Biomarker	Value	Interpretation	Level of evidence
CYP1A2	*1A/*1A	Normal metabolizer	FDA

Naloxone

General drug info:
https://new-portal.pillcheck.net/medication/T2R9

Patients with the AA genotype who are treated with naloxone may have lower cortisol response to opioid blockade as compared to patients with the AG or GG genotype. Other genetic and clinical factors may also influence the response to naloxone.

Biomarker	Value	Interpretation	Level of evidence
OPRM1	A/A	Normal sensitivity to opioids	CPIC C

Naltrexone

General drug info:
https://new-portal.pillcheck.net/medication/Q9H9

Patients with the AA genotype who are treated with naltrexone may have a decreased 1) response to naltrexone, 2) blunting of alcohol craving, 3) severity of intoxication when exposed to ethanol and naltrexone as compared to patients with the AG or GG genotype, 4) may experience increased efficacy of opioids for pain and opioid related drugs to treat addiction. The association with naltrexone response has been contradicted in other studies. Other genetic and clinical factors may also influence a patient's response to naltrexone.

Biomarker	Value	Interpretation	Level of evidence
OPRM1	A/A	Normal sensitivity to opioids	CPIC C

Naproxen

General drug info:
https://new-portal.pillcheck.net/medication/E9C6

Naproxen, compared to other NSAIDs, is less affected by genetic variations in the CYP2C9 enzyme. Naproxen is not recommended in patients with clinically significant GI events throughout the entire GI tract. Naproxen has the lowest CV risk, while other medications like diclofenac and etoricoxib pose the greatest cardiovascular risk.

Biomarker	Value	Interpretation	Level of evidence
CYP2C9	*3/*3	Poor metabolizer	CPIC C

Nebivolol

General drug info:
https://new-portal.pillcheck.net/medication/K4T8

Enhanced drug clearance, compared to Normal Metabolizers, is anticipated which may result in decreased response to Nebivolol. Other genetic and clinical factors may also influence a patient's metabolism of Nebivolol.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	FDA

Nefazodone

General drug info:
https://new-portal.pillcheck.net/medication/L3T3

Potentially reduced clinical effect due to enhanced drug clearance. Nefazodone has been shown in vitro to be an inhibitor of CYP3A4. Interactions have been observed between nefazodone and triazolam, alprazolam, buspirone, atorvastatin, and simvastatin. CYP2D6 poor metabolizers have a higher risk of interactions with debrisoquine, dextromethorphan, and the tricyclic antidepressants.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	FDA

Nevirapine

General drug info:
https://new-portal.pillcheck.net/medication/T8P2

Reduced risk for Nevirapine-induced toxicity. Nevirapine enhances the clearance of coadministered drugs metabolized by CYP3A4. This induction is most pronounced in extensive metabolizers requiring dose adjustment.

Biomarker	Value	Interpretation	Level of evidence
CYP2B6	*1/*1	Normal metabolizer	CPIC B

Nicardipine

General drug info:
https://new-portal.pillcheck.net/medication/F2N7

Normal nicardipine metabolism is anticipated. Strong CYP3A4 inducers and inhibitors can affect nicardipine metabolism, clinical response and tolerability.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	FDA

Nilotinib

General drug info:
https://new-portal.pillcheck.net/medication/E9Q7

Normal metabolism is anticipated; standard dosing and precautions are recommended. Nilotinib can increase bilirubin levels.

Biomarker	Value	Interpretation	Level of evidence
UGT1A1	*1/*1	Normal metabolizer	CPIC C

Nirmatrelvir / ritonavir

General drug info:
https://new-portal.pillcheck.net/medication/T8E4

Be alert to inherently decreased clearance of nirmatrelvir and ritonavir and the potentially increased risk of side effects. Co-administration of darunavir and ritonavir with drugs primarily metabolized by CYP3A may result in increased plasma concentrations and increase or prolong their therapeutic effect and adverse events.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Nortriptyline

General drug info:
https://new-portal.pillcheck.net/medication/T4L7

Select alternative drug (e.g., citalopram, sertraline) if possible. If not, consider increasing the dose and monitor nortriptyline + 10-hydroxynortriptyline plasma concentrations. Drugs inhibiting the activity of CYP2D6 make normal metabolizers resemble poor metabolizers. TCA may become abruptly toxic when given one of these inhibiting drugs as concomitant therapy. Quinidine, cimetidine, many other antidepressants, phenothiazines, and the Type 1C antiarrhythmics propafenone and flecainide, as well as fluoxetine, sertraline, and paroxetine also inhibit CYP2D6. Sufficient time must elapse before initiating TCA treatment in a patient being withdrawn from fluoxetine, given the long half-life of the parent and active metabolite (at least 5 weeks may be necessary).

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC A

Olanzapine

General drug info:
https://new-portal.pillcheck.net/medication/T3X9

Normal drug metabolism is anticipated. A decrease in the dose of Olanzapine should be considered if treatment with an inhibitor of CYP1A2 is initiated. Fluvoxamine, a CYP1A2 inhibitor results in a 54% mean increase in Olanzapine Cmax in female non-smokers and 77% in male smokers. Other genetic and clinical factors may also influence a patient's response to Olanzapine.

Biomarker	Value	Interpretation	Level of evidence
CYP1A2	*1A/*1A	Normal metabolizer	EMA

Omeprazole

General drug info:
https://new-portal.pillcheck.net/medication/F2V4

Initiate standard starting daily dose. Consider increased dose by 50-100% for the treatment of H. pylori infection and erosive esophagitis. Daily dose may be given in divided doses. Monitor for efficacy.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	CPIC B

Ondansetron

General drug info:
https://new-portal.pillcheck.net/medication/Y3H7

CYP2D6 Ultrarapid Metabolizers are more likely to have a decreased response to Ondansetron as compared to other metabolizer groups. This decreased response leads to a higher risk of vomiting after chemotherapy or anesthesia. No significant associations have been observed for nausea. Select an alternative drug not predominantly metabolized by CYP2D6 (i.e. granisetron)

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC A

Oxycodone

General drug info:
https://new-portal.pillcheck.net/medication/J8R8

Increased formation of oxymorphone formation following oxycodone administration, leading to a higher risk of toxicity. Avoid oxycodone use due to the potential for toxicity. Alternatives that are not affected by this CYP2D6 phenotype include morphine and non-opioid analgesics. Tramadol and hydrocodone are not good alternatives because their metabolism is affected by CYP2D6 activity.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC A
OPRM1	A/A	Normal sensitivity to opioids	CPIC C

Palonosetron

General drug info:
https://new-portal.pillcheck.net/medication/N8M3

Enhanced CYP2D6 metabolism may decrease response to palonosetron. Therefore, similar to ondansetron, CYP2D6 Ultrarapid metabolizer are more likely to have a decreased response as compared to other metabolizer groups. The decreased response could lead to a higher risk of vomiting after chemotherapy or anesthesia. Select an alternative drug not predominantly metabolized by CYP2D6 (i.e. granisetron)

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC C

Pamidronate

General drug info:
https://new-portal.pillcheck.net/medication/J9A2

Rare diplotype of unknown functional consequence. Pamidronate clearance is not affected by CYP2C8 polymorphism. However, CYP2C8 polymorphism may lead to decreased or increased risk of osteonecrosis. Be alert to signs of osteonecrosis and other side effects. Other genetic and clinical factors may also influence adverse responses to bisphosphonates.

Biomarker	Value	Interpretation	Level of evidence
CYP2C8	*4/*4	Unknown metabolizer	FDA

Pantoprazole

General drug info:
https://new-portal.pillcheck.net/medication/X2K3

Initiate standard starting daily dose. Consider increased dose by 50-100% for the treatment of H. pylori infection and erosive esophagitis. Daily dose may be given in divided doses. Monitor for efficacy.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	CPIC A

Paroxetine

General drug info:
https://new-portal.pillcheck.net/medication/V6Y9

Increased metabolism to less active compounds when compared to extensive metabolizers. Lower/undetectable plasma concentrations may increase probability of pharmacotherapy failure. Select alternative drug not predominantly metabolized by CYP2D6. Coadministration of paroxetine with other drugs that are metabolized by CYP2D6, including certain drugs effective in the treatment of major depressive disorder should be avoided. Due to the risk of serious ventricular arrhythmias and sudden death potentially associated with elevated plasma levels of thioridazine, paroxetine, and thioridazine should not be coadministered. Tamoxifen is a pro-drug requiring metabolic activation by CYP2D6. Inhibition of CYP2D6 by paroxetine may lead to reduced plasma concentrations of an active metabolite (endoxifen) and hence reduced efficacy of tamoxifen.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC A

Pazopanib

General drug info:
https://new-portal.pillcheck.net/medication/M3L3

Patients with an extensive metabolizer genotype when treated with pazopanib may have decreased risk, but not absence, of hyperbilirubinemia. Other genetic and clinical factors may also influence adverse events associated with pazopanib. Co-administration of pazopanib with strong inhibitors of CYP3A4 (e.g., ketoconazole, ritonavir, clarithromycin) increases pazopanib concentrations and should be avoided. If co-administration of a strong CYP3A4 inhibitor is warranted, reduce the dose of pazopanib to 400 mg.

Biomarker	Value	Interpretation	Level of evidence
UGT1A1	*1/*1	Normal metabolizer	CPIC B

Perampanel

General drug info:
https://new-portal.pillcheck.net/medication/E3P8

Be aware that inherently reduced perampanel clearance is anticipated, enhancing clinical response and increasing the risk of side effects. Avoid co-administration of strong CYP3A4 inhibitors.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Perphenazine

General drug info:
https://new-portal.pillcheck.net/medication/T4T2

Potentially reduced clinical effect due to enhanced drug clearance.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC B

Phenprocoumon

General drug info:
https://new-portal.pillcheck.net/medication/R9N3

High risk of side effects; consider alternative anticoagulants such as Factor Xa inhibitors. Check INR more frequently. Symptoms of overdose include suspected or overt abnormal bleeding (e.g., appearance of blood in stools or urine, hematuria, excessive menstrual bleeding, melena, petechiae, excessive bruising or persistent oozing from superficial injuries). Monitor INR when initiating or discontinuing medications may affect the metabolism of phenprocoumon.

Biomarker	Value	Interpretation	Level of evidence
CYP2C9	*3/*3	Poor metabolizer	CPIC B
VKORC1	T/T	Low Vitamin K production	CPIC B

Phenytoin

General drug info:
https://new-portal.pillcheck.net/medication/R7A6

Standard loading dose. Reduce maintenance dose by 60-50%. Evaluate response and serum concentration after 7-10 days. Be alert to ADEs (e.g., ataxia, nystagmus, dysarthria, sedation). Patients of Chinese ancestry have found a strong association between the risk of developing SJS/TEN and the presence of HLA-B*1502.

Biomarker	Value	Interpretation	Level of evidence
CYP2C9	*3/*3	Poor metabolizer	CPIC A

Pimozide

General drug info:
https://new-portal.pillcheck.net/medication/E9N3

Enhanced drug clearance expected; be alert to reduced clinical efficacy.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC B

Piroxicam

General drug info:
https://new-portal.pillcheck.net/medication/Y2K7

Choose an alternative therapy not metabolized by CYP2C9 or not significantly impacted by CYP2C9 genetic variants in vivo or choose an NSAID metabolized by CYP2C9 but with a shorter half-life (such as celecoxib, fluriprofen, lornoxicam, and ibuprofen) or therapies not primarily metabolized by CYP2C9 (aspirin, ketorolac, naproxen and sulindac).

Biomarker	Value	Interpretation	Level of evidence
CYP2C9	*3/*3	Poor metabolizer	FDA

Pitavastatin

General drug info:
https://new-portal.pillcheck.net/medication/H7X6

High risk for developing pitavastatin-induced myopathy. Prescribe ≤1mg as a starting dose and adjust doses of pitavastatin based on disease-specific guidelines. If a dose >1mg is needed for desired efficacy, consider an alternative statin or combination therapy.

Biomarker	Value	Interpretation	Level of evidence
SLCO1B1	*5/*5	Poor function	CPIC A

Pitolisant

General drug info:
https://new-portal.pillcheck.net/medication/C7W7

Increased pitolisant metabolism is anticipated, potentially reducing clinical response. The recommended dosage range is 17.8 mg to 35.6 mg daily. Initiate with 8.9 mg once daily for a week. For second week increase dosage to 17.8 mg once daily. Depending on tolerability, may increase to the maximum recommended dosage of 35.6 mg once daily starting third week. Avoid the use of strong CYP2D6 and CYP3A4 inhibitors.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC A

Posaconazole

General drug info:
https://new-portal.pillcheck.net/medication/E8H3

Significantly reduced posaconazole clearance is anticipated; consider alternative antifungal medication.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Prasugrel

General drug info:
https://new-portal.pillcheck.net/medication/V6E9

Normal clopidogrel metabolism is anticipated. Studies have shown that prasugrel active metabolite levels were higher in patients older than 75 years compared with a younger group. In clinical pharmacology studies, after adjusting for body weight, the AUC of the active metabolite was approximately 19% higher in Chinese, Japanese, and Korean. Prasugrel increases the risk of intracranial bleeding in patients with a history of TIA or stroke.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	FDA

Pravastatin

General drug info:
https://new-portal.pillcheck.net/medication/R6Y6

High risk for developing pravastatin-induced myopathy. Prescribe ≤40mg per day as a starting dose and adjust doses of pravastatin based on disease-specific guidelines. If a dose >40mg is needed, consider a higher dose (>40mg) if patient is tolerating 40mg or an alternative statin or combination therapy. Please consult a clinical pharmacist for more information.

Biomarker	Value	Interpretation	Level of evidence
SLCO1B1	*5/*5	Poor function	CPIC A

Propafenone

General drug info:
https://new-portal.pillcheck.net/medication/V2C6

Enhanced drug clearance. Propafenone is used to treat cardiac arrhythmia, but should be used only if the condition is thought to be life-threatening. Propafenone is metabolized by CYP2D6, CYP3A4 and CYP1A2 enzymes. The combination of propafenone and inhibition of CYP3A4 and/or CYP2D6 could be hazardous. Desipramine, paroxetine, ritonavir, sertraline block CYP2D6; ketoconazole, erythromycin, saquinavir, and grapefruit juice inhibit CYP3A4 and should be avoided. Amiodarone inhibits CYP1A2 and can cause increased plasma levels of propafenone.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC C

Propofol

General drug info:
https://new-portal.pillcheck.net/medication/L7C7

Normal clearance is anticipated. Consider regular dosing of 50 - 100 mcg/kg/min. Other factors can impact on propofol clearance and response.

Biomarker	Value	Interpretation	Level of evidence
CYP2B6	*1/*1	Normal metabolizer	FDA

Propranolol

General drug info:
https://new-portal.pillcheck.net/medication/F8V2

Enhanced CYP2D6 activity can decrease S-propranolol plasma concentration when treated with propranolol as compared to extensive metabolizers.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC C

Protriptyline

General drug info:
https://new-portal.pillcheck.net/medication/X4K8

Enhanced Drug clearance. Ultrafast CYP2D6 metabolizers will have lower than expected plasma concentrations of tricyclic antidepressants (TCAs) when given the usual doses. Certain drugs that inhibit the activity of the CYP2D6 isozyme can make normal metabolizers resemble poor metabolizers. A patient who is stable on a given dose of TCA may experience abrupt toxicity when given one of these inhibiting drugs as concomitant therapy. CYP2D6 inhibiting drugs include quinidine, cimetidine and many other antidepressants, phenothiazines, and the Type 1C antiarrhythmics, propafenone and flecainide.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC B

Quetiapine

General drug info:
https://new-portal.pillcheck.net/medication/F9H9

Significantly reduced quetiapine clearance by CYP3A4 might be somewhat offset by enhanced CYP3A5 function. Be alert to signs of side effects. Consider alternative therapy for patients with depression. For other indications use 30% of the standard dose, and adjust based on tolerability and response. Aripiprazole appears to be less dependent on CYP3A4 for metabolism. Olanzapine is not metabolised by CYP3A4/5.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	DPWG
CYP3A5	*1/*3	Intermediate metabolizer	FDA

Quinidine

General drug info:
https://new-portal.pillcheck.net/medication/R7X6

Quinidine is not metabolized by CYP2D6, but it inhibits the action of cytochrome CYP2D6, effectively converting extensive metabolizers into poor metabolizers. May have lower impact in Ultrafast CYP2D6 metabolizers. Caution must be exercised whenever quinidine is prescribed together with drugs metabolized by CYP2D6.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC B

Rabeprazole

General drug info:
https://new-portal.pillcheck.net/medication/E9E8

Normal drug response is anticipated. Rabeprazole is less affected by CYP2C19 variation than Omeprazole.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	CPIC B

Raltegravir

General drug info:
https://new-portal.pillcheck.net/medication/P2N7

Normal raltegravir clearance is anticipated.

Biomarker	Value	Interpretation	Level of evidence
UGT1A1	*1/*1	Normal metabolizer	CPIC B

Ranolazine

General drug info:
https://new-portal.pillcheck.net/medication/P9K6

There are no dosage guidelines for Ranolazine for subjects who are Ultrarapid metabolizers of CYP2D6. Enhanced drug clearance may reduce clinical response at standard doses.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	FDA

Rasagiline

General drug info:
https://new-portal.pillcheck.net/medication/T8M8

Normal drug clearance is anticipated. Patients with mild hepatic impairment or concomitant use of ciprofloxacin or other CYP1A2 inhibitors should not exceed a dose of 0.5 mg rasagiline, once daily. Avoid concomitant use of meperidine, tramadol, methadone, propoxyphene, dextromethorphan, St. John's wort, cyclobenzaprine, or other MAO inhibitor. Avoid rasagiline use in patients with moderate or severe hepatic impairment.

Biomarker	Value	Interpretation	Level of evidence
CYP1A2	*1A/*1A	Normal metabolizer	FDA

Regorafenib

General drug info:
https://new-portal.pillcheck.net/medication/H3T4

Significantly reduced regorafenib clearance is anticipated, greatly increasing the risk of side effects. Avoid concomitant use of strong inhibitors of CYP3A4 activity (e.g. clarithromycin, grapefruit juice, itraconazole, ketoconazole, posaconazole, telithromycin, and voriconazole).

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Remdesivir

General drug info:
https://new-portal.pillcheck.net/medication/V7M8

The average risk of remdesivir□associated liver enzyme elevations is anticipated. Monitoring for liver enzymes is prudent.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	FDA

Risperidone

General drug info:
https://new-portal.pillcheck.net/medication/Q3K6

Enhanced drug clearance may affect clinical response. Choose an alternative or titrate the dose according to the maximum dose for the active metabolite (paliperidone) (oral 12 mg/day for adults and children from 15 years of age weighing at least 51 kg and 6 mg/day for children from 15 years of age weighing less than 51 kg; intramuscular 75 mg per 2 weeks).

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC B

Rivaroxaban

General drug info:
https://new-portal.pillcheck.net/medication/K9X6

Significantly reduced drug metabolism is anticipated, which may lead to increased drug exposure and risk of bleeding. Inhibitors of CYP3A4 can further decrease metabolism while CYP3A4 inducers can increase the metabolism of rivaroxaban. P-glycoprotein inhibitors can increase the absorption of rivaroxaban, while inducers can reduce the absorption of rivaroxaban. Agents that interfere with both P-glycoprotein and CYP3A4 are likely to cause more significant interactions with rivaroxaban than agents that interfere with P-glycoprotein or CYP3A4 alone. Avoid the use of combined P- glycoprotein and strong CYP3A4 inhibitors or inducers. If strong inhibitors are co-administered in Poor metabolizers of CYP3A4, use rivaroxaban with caution or avoid use.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Rolapitant

General drug info:
https://new-portal.pillcheck.net/medication/H2A4

Be alert about inherently reduced rolaprepitant clearance. Higher rolaprepitant exposure is expected to enhance clinical response and risk of side effects. Higher rolaprepitant concentrations will further increase exposure of co-administered drugs metabolized by CYP2D6, CYP3A4, BCRP and P-gp.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Rosuvastatin

General drug info:
https://new-portal.pillcheck.net/medication/Y3H4

This patient is predicted to have SLCO1B1 poor function and may be at an increased risk of rosuvastatin-induced myopathy. Prescribe ≤20mg per day as a starting dose and adjust doses of rosuvastatin based on disease-specific and specific population guidelines. If a dose >20mg is needed for desired efficacy, consider an alternative statin or combination therapy. Because ABCG2 phenotype could not be assessed, it is not known if ABCG2 results would further influence the recommended dose or drug.

Biomarker	Value	Interpretation	Level of evidence
SLCO1B1	*5/*5	Poor function	CPIC A

Ruxolitinib

General drug info:
https://new-portal.pillcheck.net/medication/X8J9

Significantly reduced or absent ruxolitinib clearance is anticipated. Consider alternative treatment or dose reduction.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Sacituzumab govitecan

General drug info:
https://new-portal.pillcheck.net/medication/C9X2

Normal drug clearance is anticipated; average risk for neutropenia, febrile neutropenia, diarrhea and anemia. Closely monitor patients for adverse reactions. Monitor patients with diarrhea and give fluid and electrolytes as needed. At the onset of diarrhea, evaluate for infectious causes and, if negative, promptly initiate loperamide. Withhold or permanently discontinue treatment based on clinical assessment of the onset. Consider reducing subsequent doses.

Biomarker	Value	Interpretation	Level of evidence
UGT1A1	*1/*1	Normal metabolizer	FDA

Sertindole

General drug info:
https://new-portal.pillcheck.net/medication/X4M6

Significantly increased sertindole clearance is anticipated, affecting clinical response. Avoid the use of strong CYP2D6 inhibitors such as fluoxetine or paroxetine. Concomitant use of CYP3A4 inhibitors such as macrolide antibiotics (erythromycin) and calcium antagonists (diltiazem, verapamil) can increase sertindole plasma concentrations. A lower maintenance dose of sertindole may be required, as may careful ECG monitoring before and after each dose adjustment of these drugs.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	FDA

Sertraline

General drug info:
https://new-portal.pillcheck.net/medication/X8L7

Initiate therapy with recommended starting dose.

Biomarker	Value	Interpretation	Level of evidence
CYP2B6	*1/*1	Normal metabolizer	CPIC A
CYP2C19	*1/*1	Normal metabolizer	CPIC A

Sildenafil

General drug info:
https://new-portal.pillcheck.net/medication/E2M7

Significantly reduced drug clearance is anticipated. Substantially increased risk of decreased blood pressure, syncope, and prolonged erection due to higher sildenafil exposures. Concomitant use of alpha-blockers or amlodipine produces additive blood pressure lowering effects. In patients taking strong CYP3A4 inhibitors, such as ritonavir, sildenafil exposure is increased and a decrease in sildenafil dosage is strongly recommended.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Simvastatin

General drug info:
https://new-portal.pillcheck.net/medication/H8C4

High risk for developing simvastatin-induced myopathy. Prescribe an alternative statin depending on the desired potency.

Biomarker	Value	Interpretation	Level of evidence
SLCO1B1	*5/*5	Poor function	CPIC A

Siponimod

General drug info:
https://new-portal.pillcheck.net/medication/C9H3

Extremely reduced siponimod clearance leading to high risk of toxicity. As per drug label, siponimod use is contra-indicated in patients with CYP2C9 *3/*3 diplotype.

Biomarker	Value	Interpretation	Level of evidence
CYP2C9	*3/*3	Poor metabolizer	CPIC A

Sirolimus

General drug info:
https://new-portal.pillcheck.net/medication/W8P7

Significantly reduced sirolimus clearance by CYP3A4, somewhat offset by enhanced CYP3A5 function. Be alert to an increased risk of side effects. Consider alternative treatment or starting at a lower dose, and adjust based on tolerability and response. Therapeutic monitoring is required.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	CPIC C
CYP3A5	*1/*3	Intermediate metabolizer	CPIC C

Sunitinib

General drug info:
https://new-portal.pillcheck.net/medication/Y9A8

Significantly reduced sunitinib clearance is anticipated, greatly incresing the risk of toxicity. Avoid the use of strong CYP3A4 inhibitors; consider sunitinib dose reduction minimum of 37.5 mg (GIST and RCC) or 25 mg (pNET) daily. Monitor carefully for toxicity.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Tacrolimus

General drug info:
https://new-portal.pillcheck.net/medication/A6X2

Significantly reduced clearance by CYP3A4 somewhat offset by increased CYP3A5 function. An increased risk of side effects at standard dose ranges. A dose reduction might be warranted. Total starting dose should not exceed 0.3mg/kg/day. Follow with therapeutic drug monitoring given the risk of arterial vasoconstriction, hypertension and nephrotoxicity that can occur with supratherapeutic tacrolimus concentrations. Further dose adjustments or selection of alternative therapy may be necessary due to other clinical factors (medication interactions, or hepatic function).

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	CPIC B
CYP3A5	*1/*3	Intermediate metabolizer	CPIC A

Tadalafil

General drug info:
https://new-portal.pillcheck.net/medication/P3E7

Significantly reduced drug clearance is anticipated. Substantially increased risk of decreased blood pressure, syncope, and prolonged erection due to higher tadalafil exposures. Consider dose reduction or alternative treatment. Concomitant administration of alpha-blockers or amlodipine produces additive blood pressure lowering effects. Avoid the use of CYP3A4 inhibitors.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Tamoxifen

General drug info:
https://new-portal.pillcheck.net/medication/X6P6

There are no therapeutic dose recommendations for Ultrarapid CYP2D6 metabolizers. Be alert to adverse drug events: QTc prolongation, INR increase < 4.5 and kinetic effect.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6	*1/*1	Ultrarapid metabolizer	CPIC A
CYP2D6 CNV	3N		

Tamsulosin

General drug info:
https://new-portal.pillcheck.net/medication/L7N3

Enhanced clearance of tamsulosin is expected, which may affect clinical response at normal doses. Concomitant treatment with paroxetine, which is strong CYP2D6 inhibitor, results in an increase in the Cmax and AUC of tamsulosin by a factor of 1.3 and 1.6, respectively. Tamsulosin 0.4 mg capsules should not be used in combination with strong inhibitors of CYP3A4 (e.g., ketoconazole).

Biomarker	Value	Interpretation	Level of evidence
CYP2D6	*1/*1	Ultrarapid metabolizer	CPIC C
CYP2D6 CNV	3N		

Tegafur

General drug info:
https://new-portal.pillcheck.net/medication/W9H6

Normal DPYD activity and "normal" risk for fluoropyrimidine toxicity. Use label-recommended dosage and administration.

Biomarker	Value	Interpretation	Level of evidence
DPYD	*1/*1	Normal metabolizer	CPIC C

Temsirolimus

General drug info:
https://new-portal.pillcheck.net/medication/F9X6

Significantly reduced temsirolimus and sirolimus clearance by CYP3A4, somewhat offset by enhanced CYP3A5 function. Be alert to an increased risk of side effects. Consider alternative treatment or starting at a lower dose, and adjust based on tolerability and response. Therapeutic monitoring is required.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA
CYP3A5	*1/*3	Intermediate metabolizer	FDA

Tenoxicam

General drug info:
https://new-portal.pillcheck.net/medication/Q3J7

Choose an alternative therapy not metabolized by CYP2C9 or not significantly impacted by CYP2C9 genetic variants in vivo or choose an NSAID metabolized by CYP2C9 but with a shorter half-life (such as celecoxib, fluriprofen, lornoxicam, and ibuprofen).

Biomarker	Value	Interpretation	Level of evidence
CYP2C9	*3/*3	Poor metabolizer	CPIC A

Terbinafine

General drug info:
https://new-portal.pillcheck.net/medication/Q6M9

Enhanced drug clearance may affect clinical response. Terbinafine is an inhibitor of CYP2D6 isozyme and has an effect on metabolism of desipramine, cimetidine, fluconazole, cyclosporine, rifampin, and caffeine. Drugs predominantly metabolized by the CYP2D6 isozyme include the following drug classes: tricyclic antidepressants, selective serotonin reuptake inhibitors, beta-blockers, antiarrhythmics class 1C (e.g., flecainide and propafenone) and monoamine oxidase inhibitors Type B. Coadministration of terbinafine should be done with careful monitoring and may require a reduction in dose of the 2D6-metabolized drug

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC C

Tetrabenazine

General drug info:
https://new-portal.pillcheck.net/medication/K6L7

There are no Tetrabenazine dosage guidelines for Ultrarapid metabolizers of CYP2D6. Be alert to symptoms of insufficient therapeutic effects. Potentially reduced risk of toxicity. Titrate drug dose weekly. CYP2D6 inhibitors (paroxetine, fluoxetine, quinidine) markedly increase exposure to alpha-HTBZ and beta-HTBZ, requiring a dose reduction of Tetrabenzine.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	FDA

Thioguanine

General drug info:
https://new-portal.pillcheck.net/medication/H3W9

Start with reduced doses (50–80% of normal dose) if normal stating dose is > 40–60 mg/m2/day (e.g., 20–48 mg/ m2/day) and adjust doses of thioguanine based on degree of myelosuppression and disease-specific guidelines. Allow 2-4 weeks to reach steady-state after each dose adjustment. If myelosuppression occurs, and depending on other therapy, emphasis should be on reducing thioguanine over other agents. The functional status of NUDT15 could not be determined, hence its contribution to further dose adjustments is unknown.

Biomarker	Value	Interpretation	Level of evidence
TPMT	*1/*2	Intermediate metabolizer	CPIC A

Thioridazine

General drug info:
https://new-portal.pillcheck.net/medication/Y3A7

Enhanced drug clearance may affect clinical response. Thioridazine may increase the risk of Torsades de pointes and/or sudden death in association with the use of drugs that prolong the QTc interval. Certain circumstances may increase this risk, including 1) bradycardia, 2) hypokalemia, 3) concomitant use of other drugs that prolong the QTc interval, 4) presence of congenital prolongation of the QT interval, and 5) for thioridazine coadministration with drugs that may inhibit P450 2D6 or by some other mechanism interfere with the clearance of thioridazine.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC C

Thiothixene

General drug info:
https://new-portal.pillcheck.net/medication/A7C2

Enhanced drug clearance is anticipated potentially affecting clinical response. Use of CYP2D6 inhibitors can affect thiothixene exposure.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	FDA

Ticagrelor

General drug info:
https://new-portal.pillcheck.net/medication/T2P8

Significantly reduced clearance of ticagrelor leads to increased drug exposure. Significantly increased risk of bleeding. Consider alternative antiplatelet treatment options such as prasugrel. Prasugrel mediated inhibition of platelet aggregation is not affected by genetic variation in CYP2B6, CYP2C9, CYP2C19, or CYP3A5 genes.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Timolol

General drug info:
https://new-portal.pillcheck.net/medication/P4L6

Enhanced drug clearance may affect clinical response. Lower risk of side effects such as decreased heart rate (i.e., systemic beta-blockade).

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC C

Tolperisone

General drug info:
https://new-portal.pillcheck.net/medication/V6T3

Significantly enhanced tolperisone clearance is anticipated, leading to potentially reduced clinical response.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	FDA
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	FDA

Tolterodine

General drug info:
https://new-portal.pillcheck.net/medication/R8M8

Enhanced drug metabolism of tolterodine to its active metabolite DD01 (5-HM). However, since tolterodine and DD01 (5-HM) have similar pharmacological effects, the net activity of tolterodine is expected to be similar regardless of CYP2D6 metabolizer status. Proceed with caution in patients with a known history of QT prolongation or patients who are taking Class IA (e.g., quinidine, procainamide) or Class III (e.g., amiodarone, sotalol) antiarrhythmic medications.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	FDA

Tramadol and acetaminophen

General drug info:
https://new-portal.pillcheck.net/medication/M2M2

Increased formation of O-desmethyltramadol (M1) formation following tramadol administration, leading to higher risk of toxicity. Avoid Tramadol use due to potential for toxicity. Alternatives that are not affected by this CYP2D6 phenotype include morphine and non-opioid analgesics. Hydrocodone and oxycodone are not good alternatives because their metabolism is affected by CYP2D6 activity.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC A
OPRM1	A/A	Normal sensitivity to opioids	CPIC C

Trazodone

General drug info:
https://new-portal.pillcheck.net/medication/H2A8

Significantly reduced drug clearance is anticipated, increasing the risk of side effects. Avoid concomitant use with a CYP3A4 inhibitor. Adverse reactions may occur upon discontinuation; gradually reduce the dosage rather than stopping trazodone abruptly. Concomitant use of aspirin, NSAIDS, other antiplatelet drugs, warfarin, and other anticoagulants may increase the risk of bleeding events.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Triazolam

General drug info:
https://new-portal.pillcheck.net/medication/J2Q9

Significantly reduced clearance by CYP3A4 might be somewhat offset by increased clearance by CYP3A5. Be alert to potentially altered clinical response and signs of side effects. Other clinical and genetic factors may also influence the clearance and metabolism of alprazolam, midazolam and triazolam.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA
CYP3A5	*1/*3	Intermediate metabolizer	FDA

Trimipramine

General drug info:
https://new-portal.pillcheck.net/medication/X3V8

Avoid the use of amitriptyline, clomipramine, doxepin, imipramine, trimipramine due to significantly enhanced clearance and reduced response.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	CPIC A
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC A

Tropisetron

General drug info:
https://new-portal.pillcheck.net/medication/Q4T2

In Ultrarapid Metabolizers, there is increased metabolism of Tropisetron to less active compounds when compared to normal metabolizers, and this is associated with decreased response. Select an alternative drug that is not predominantly metabolized by CYP2D6 (i.e. Granisetron).

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC A

Upadacitinib

General drug info:
https://new-portal.pillcheck.net/medication/V8L3

Significantly reduced upadacitinib clearance is anticipated. Increased upadacitinib exposure can enhance clinical response and increase the risk of side effects. Upadacitinib should be used with caution; avoid co-administration of strong CYP3A4 inhibitors (such as ketoconazole).

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Valbenazine

General drug info:
https://new-portal.pillcheck.net/medication/H2L6

Enhanced drug clearance may affect clinical response. Decreased exposure to valbenazine's active metabolite is anticipated thus decreasing the risk of exposure-related adverse reactions. For patients who are taking a strong CYP2D6 inhibitor, dose reduction may be necessary. The initial dose is 40 mg once daily. The recommended dose for patients with moderate or severe hepatic impairment is 40 mg once daily.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	FDA

Valproic acid / divalproex

General drug info:
https://new-portal.pillcheck.net/medication/N9E6

Significantly reduced clearance anticipated; use non-VPA therapy for the children with two mutated CYP2C9 alleles.

Biomarker	Value	Interpretation	Level of evidence
CYP2C9	*3/*3	Poor metabolizer	CPIC B

Valsartan

General drug info:
https://new-portal.pillcheck.net/medication/M7L4

Decreased metabolism of valsartan by CYP2C9 is anticipated, increasing exposure to this medication. Other genetic and clinical factors may also influence valsartan metabolism and response. Consider using ARBs less dependent on CYP2C9 metabolism such as eprosartan, telmisartan or olmesartan.

Biomarker	Value	Interpretation	Level of evidence
CYP2C9	*3/*3	Poor metabolizer	FDA

Vardenafil

General drug info:
https://new-portal.pillcheck.net/medication/E3J3

Significantly reduced drug clearance is anticipated. Substantially increased risk of syncope, decreased blood pressure, and prolonged erection. Avoid vardenafil in patients also taking CYP3A4 inhibitors.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Venlafaxine

General drug info:
https://new-portal.pillcheck.net/medication/K2M3

Be alert to a possible decrease in the sum of the plasma concentrations of venlafaxine and the active metabolite O-desmethylvenlafaxine. Consider alternative antidepressants not metabolized by CYP2D6. If necessary, increase the dose to 150% of the standard dose. If dose adjustment does not result in efficacy without unacceptable side effects or dose adjustment based on therapeutic drug monitoring is not possible, then venlafaxine should be avoided.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	CPIC C
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC A

Vernakalant

General drug info:
https://new-portal.pillcheck.net/medication/R4Y7

Faster vernakalant clearance is anticipated potentially affecting clinical response.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6	*1/*1	Ultrarapid metabolizer	FDA
CYP2D6 CNV	3N		

Vilazodone

General drug info:
https://new-portal.pillcheck.net/medication/M7J8

Significantly reduced vilazodone clearance is anticipated, increasing the risk of side effects. Consider alternative treatment or 50% vilazodone dosage decrease.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Viloxazine

General drug info:
https://new-portal.pillcheck.net/medication/N7L3

Be alert about faster viloxazine clearance and potentially reduced clinical response. Standard dosing recommendations apply; avoid concomitant administration of sensitive CYP1A2 substrates.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6	*1/*1	Ultrarapid metabolizer	FDA
CYP2D6 CNV	3N		

Voriconazole

General drug info:
https://new-portal.pillcheck.net/medication/C2A8

For pediatric or adult patients: initiate therapy with recommended standard dosing. 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, TDM and co-morbidities.

Biomarker	Value	Interpretation	Level of evidence
CYP2C19	*1/*1	Normal metabolizer	CPIC A

Vortioxetine

General drug info:
https://new-portal.pillcheck.net/medication/K7N6

In CYP2D6 ultra-rapid metabolizers, there is an increased drug clearance; the plasma concentration of vortioxetine administered at 10 mg/day were between those obtained in extensive metabolizers at 5 mg/day and 10 mg/day. Therefore, depending on individual patient response, a dose adjustment may be considered.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6	*1/*1	Ultrarapid metabolizer	CPIC B
CYP2D6 CNV	3N		

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Warfarin

General drug info:
https://new-portal.pillcheck.net/medication/K3V8

Recommended starting dose is in the range of 0.5-2mg. Low warfarin initiation dose and frequent blood coagulation (INR) monitoring are required when initiating or discontinuing medications that may influence the metabolism of warfarin. Consider alternative treatment with Factor Xa inhibitors.

Biomarker	Value	Interpretation	Level of evidence
CYP2C9	*3/*3	Poor metabolizer	CPIC A
VKORC1	T/T	Low Vitamin K production	CPIC A

Ziprasidone

General drug info:
https://new-portal.pillcheck.net/medication/L2T3

Be alert about inherently decreased ziprasidone clearance, enhanced clinical response and side effects. Ziprasidone should not be used with any drug that prolongs the QT interval. Caution should be used when it is combined with other centrally-acting drugs. Because of its potential for inducing hypotension, ziprasidone may enhance the effects of certain antihypertensive agents. Ziprasidone may antagonize the effects of levodopa and dopamine agonists. Consider dose adjustment or alternative therapy.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Zonisamide

General drug info:
https://new-portal.pillcheck.net/medication/W3J2

Significantly reduced zonisamide clearance is anticipated. Consider alternative treatment.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Zopiclone

General drug info:
https://new-portal.pillcheck.net/medication/V2V7

Significantly reduced clearance is anticipated increasing total exposure and clinical response. Avoid the use in elderly adults. Consider dose reduction or alternative medication not metabolized by CYP3A4. Patients with impaired liver function also may exhibit increased exposure to zopiclone.

Biomarker	Value	Interpretation	Level of evidence
CYP3A4	*6/*6	Poor metabolizer	FDA

Zuclopenthixol

General drug info:
https://new-portal.pillcheck.net/medication/K7W8

Be alert to low zuclopenthixol plasma concentrations, if the effectiveness is insufficient: try a dose increase. Do not exceed 1.5 times the normal dose. Alternative drugs not affected by CYP2C6 metabolism are flupentixol, penfluridol, quetiapine, olanzapine or clozapine.

Biomarker	Value	Interpretation	Level of evidence
CYP2D6 CYP2D6 CNV	*1/*1 3N	Ultrarapid metabolizer	CPIC C

End of Pillcheck™ Report