PHAMATECH
Laboratories & Diagnostics

Requesting Physician)	**Patient Name**	**Accession ID:** 12704787
Patient SSN:	**Medication:** ADDERALL, CELEBREX, PROZAC, TRAZADONE	**Collected:** 08/01/2022 00:00
Patient DOB:		**Received:** 08/03/2022 09:40am
DX Code: F90.0, F32.9, G47.00, M79.673		**Report Date:** 08/16/2022 12:01pm

Patient Medications

Medication Taken	Clinical Recommendations / Predicted Metabolic Response[#1] (Prediction is based solely on the results of genetic testing. Other factors may influence drug metabolism)	Alternative Medications with Low Genetic Impact[#2] (Use standard precautions)
ADDERALL 	* Decreased metabolism through CYP2D6. Be alert to increased drug plasma concentrations.	Methylphenidate, Dexmethylphenidate, Buproprion
CELEBREX 	* Normal metabolism through CYP2C9.	
PROZAC 	* Reduced metabolism through CYP2D6. WARNING: Fluoxetine is a strong CYP2D6 inhibitor. Use extreme caution when coadministering with other CYP2D6 substrates. [FDA label] * Decreased metabolism through CYP3A4/5. * Normal metabolism through CYP2C9.	Bupropion, Milnacipran
TRAZADONE 	* Decreased metabolism through CYP3A4/5.	

 Based on patient's genotype, the medication can be prescribed according to standard regimens.

 Based on patient's genotype, the medication has potentially reduced efficacy or increased toxicity. Clinical monitoring is recommended.

 Based on patient's genotype, guidelines exist for adjusting dosage or selection of alternative medication.

#1 Metabolic pathways were identified for each medication based on the comprehensive database of Cytochrome P450 enzymes: Nucleic Acids Res. 2010 Jan;38(Database issue): D237-43

#2 Results include information on drug metabolizing enzymes/transporters for which testing was performed. Listed drugs may undergo metabolism via additional metabolic pathways.

Potentially Impacted Medications and Dosing Guidance

Medication	Dosing Guidance
Amitriptyline Amitril, Elavil, Endep	Reduced metabolism through CYP2D6 to less active compounds. Consider 25% reduction of recommended starting dose. Utilize therapeutic drug monitoring to guide dose adjustments. [Clin Pharmacol Ther. 2013 May 93(5):402-8]. Dosing recommendations only apply to higher initial doses of TCAs for treatment of conditions such as depression. Increased metabolism through CYP2C19. Consider alternative drug not metabolized by CYP2C19. If a tricyclic is warranted, utilize therapeutic drug monitoring to guide dose adjustments. [Clin Pharmacol Ther. 2013 May 93(5):402-8]
Citalopram Celexa	Increased metabolism through CYP2C19. Lower plasma concentrations will increase probability of pharmacotherapy failure. Consider an alternative drug not predominantly metabolized by CYP2C19. [Clin Pharmacol Ther. 2015 Aug;98(2):127-34]
Clomipramine Anafranil	Reduced metabolism through CYP2D6 to less active compounds. Consider 25% reduction of recommended starting dose. Utilize therapeutic drug monitoring to guide dose adjustments. [Clin Pharmacol Ther. 2013 May 93(5):402-8]. Dosing recommendations only apply to higher initial doses of TCAs for treatment of conditions such as depression. Increased metabolism through CYP2C19. Consider alternative drug not metabolized by CYP2C19. If a tricyclic is warranted, utilize therapeutic drug monitoring to guide dose adjustments. [Clin Pharmacol Ther. 2013 May 93(5):402-8]
Codeine Cheratussin, Virtussin, Tylenol#2, Tylenol#3, Tylenol#4	Reduced morphine formation. Use label-recommended age or weight-specific dosing. If no response, consider alternative medications such as oxymorphone, buprenorphine, fentanyl, methadone, hydromorphone, morphine or a nonopioid. [Clinical pharmacology & Therapeutics (2014) V 95(4), p 376-382.]
Desipramine Norpramin	Reduced metabolism through CYP2D6 to less active compounds. Consider 25% reduction of recommended starting dose. Utilize therapeutic drug monitoring to guide dose adjustments. [Clin Pharmacol Ther. 2013 May 93(5):402-8]. Dosing recommendations only apply to higher initial doses of TCAs for treatment of conditions such as depression.
Doxepin Silenor, Sinequan	Reduced metabolism through CYP2D6 to less active compounds. Consider 25% reduction of recommended starting dose. Utilize therapeutic drug monitoring to guide dose adjustments. [Clin Pharmacol Ther. 2013 May 93(5):402-8]. Dosing recommendations only apply to higher initial doses of TCAs for treatment of conditions such as depression. Increased metabolism through CYP2C19. Consider alternative drug not metabolized by CYP2C19. If a tricyclic is warranted, utilize therapeutic drug monitoring to guide dose adjustments. [Clin Pharmacol Ther. 2013 May 93(5):402-8]
Escitalopram Lexapro	Increased metabolism through CYP2C19. Lower plasma concentrations will increase probability of pharmacotherapy failure. Consider an alternative drug not predominantly metabolized by CYP2C19. [Clin Pharmacol Ther. 2015 Aug;98(2):127-34]
Esomeprazole Nexium	Increased metabolism through CYP2C19. Be alert to insufficient response. For the helicobacter pylori eradication: increase dose by 50-100%. [Clin Pharmacol Ther. 2011 May;89(5):662-73]
Flecainide Tambocor	Decreased metabolism through CYP2D6. Be alert to increased drug plasma concentration. Reduce dose by 25%, record ECG, monitor plasma concentration. [Clin Pharmacol Ther. 2011 May;89(5):662-73]
Imipramine Tofranil, Tofranil-PM	Reduced metabolism through CYP2D6 to less active compounds. Consider 25% reduction of recommended starting dose. Utilize therapeutic drug monitoring to guide dose adjustments. [Clin Pharmacol Ther. 2013 May 93(5):402-8]. Dosing recommendations only apply to higher initial doses of TCAs for treatment of conditions such as depression. Increased metabolism through CYP2C19. Consider alternative drug not metabolized by CYP2C19. If a tricyclic is warranted, utilize therapeutic drug monitoring to guide dose adjustments. [Clin Pharmacol Ther. 2013 May 93(5):402-8]
Lansoprazole Prevacid	Increased metabolism through CYP2C19. For the Helicobacter pylori eradication: increase dose by 200%. Be extra alert to insufficient response. [Clin Pharmacol Ther. 2011 May;89(5):662-73].
Lofexidine Lucemyra	Reduced metabolism through CYP2D6. Monitor adverse events such as orthostatic hypotension and bradycardia [FDA label]
Metoprolol Lopressor, Toprol XL, Metoprolol succinate	Decreased metabolism through CYP2D6. For treatment of heart failure: select alternative drug (e.g., bisoprolol, carvedilol) or reduce dose by 50%. For other indications: be alert to adverse drug reactions (e.g., bradycardia, cold extremities) or select alternative drug (e.g., atenolol, bisoprolol). [Clin Pharmacol Ther. 2011 May;89(5):662-73]
Nortriptyline Aventyl, Pamelor	Reduced metabolism through CYP2D6 to less active compounds. Consider 25% reduction of recommended starting dose. Utilize therapeutic drug monitoring to guide dose adjustments. [Clin Pharmacol Ther. 2013 May 93(5):402-8]. Dosing recommendations only apply to higher initial doses of TCAs for treatment of conditions such as depression.
Oliceridine Olinvyk	Reduced metabolism through CYP2D6. Patients with decreased CYP2D6 function who are also receiving a moderate or strong CYP3A4 inhibitor may have increased plasma concentrations of oliceridine, which may result in prolonged opioid adverse reactions and exacerbated respiratory depression. These patients may require less frequent dosing of OLINVYK. Closely monitor patients for respiratory depression and sedation at frequent intervals and base subsequent doses of OLINVYK on the patient's severity of pain and response to treatment. [FDA label]

Omeprazole Prilosec	Increased metabolism through CYP2C19. Be extra alert to insufficient response. For the Helicobacter pylori eradication: increase dose by 100-200%. Be extra alert to insufficient response. [Clin Pharmacol Ther. 2011 May;89(5):662-73]. WARNING: Omeprazole is a moderate inhibitor of CYP2C19 enzyme. Avoid concomitant use of clopidogrel and omeprazole. [FDA label]
Oxycodone Oxecta, OxyCONTIN, Oxyfast, Roxicodone, Percolone, Percodan, Tylox, Endocet, Percocet	Decreased formation of active metabolite through CYP2D6. Insufficient data to allow calculation of dose adjustment. Select alternate drug - not tramadol or codeine - or be alert to symptoms of insufficient pain relief. Alternatives that are not affected by this CYP2D6 phenotype include morphine, oxymorphone, buprenorphine, fentanyl, methadone, and hydromorphone, along with nonopioid analgesics. [Clin Pharmacol Ther. 2011 May;89(5):662-73]
Pantoprazole Protonix	Increased metabolism through CYP2C19. For the Helicobacter pylori eradication: increase dose by 400%. Be extra alert to insufficient response. [Clin Pharmacol Ther. 2011 May;89(5):662-73].
Propafenone Rythmol	Reduced metabolism through CYP2D6. Administration of RYTHMOL SR to slow and extensive metabolizers results in significant differences in plasma concentrations of propafenone, with slow metabolizers achieving concentrations about twice those of extensive metabolizers at daily doses of 850 mg/day. At low doses the differences are greater, with slow metabolizers attaining concentrations about 3 to 4 times higher than extensive metabolizers. Because the difference decreases at high doses and is mitigated by the lack of the active 5-hydroxymetabolite in the slow metabolizers, and because steady-state conditions are achieved after 4 to 5 days of dosing in all patients, the recommended dosing regimen of RYTHMOL SR is the same for all patients. [FDA label]
Thioridazine Halcion, Mellaril	Decreased metabolism through CYP2D6. Thioridazine is contradicted in patients with reduced CYP2D6 activity.[FDA label]
Tramadol Ultram, Ryzolt, ConZip, Ultracet	Decreased formation of active metabolite through CYP2D6. Be alert to decreased efficacy. Consider dose increase. If response is still inadverse drug reactionquate, select alternative drug- not oxycodone or codeine- or be alert to symptoms of insufficient pain relief. Alternatives that are not affected by this CYP2D6 phenotype include morphine, oxymorphone, buprenorphine, fentanyl, methadone, and hydromorphone, along with nonopioid analgesics. [Clin Pharmacol Ther. 2011 May;89(5):662-73]
Trimipramine Surmontil	Reduced metabolism through CYP2D6 to less active compounds. Consider 25% reduction of recommended starting dose. Utilize therapeutic drug monitoring to guide dose adjustments. [Clin Pharmacol Ther. 2013 May 93(5):402-8]. Dosing recommendations only apply to higher initial doses of TCAs for treatment of conditions such as depression. Increased metabolism through CYP2C19. Consider alternative drug not metabolized by CYP2C19. If a tricyclic is warranted, utilize therapeutic drug monitoring to guide dose adjustments. [Clin Pharmacol Ther. 2013 May 93(5):402-8]
Zuclopenthixol Clopixol	Decreased metabolism through CYP2D6. Reduce dose by 25% or select alternative drug (flupenthixol, quetiapine, olanzapine, clozapine). [Clin Pharmacol Ther. 2011 May;89(5):662-73]

Test Results

Test	Genotype Result	Phenotype Result	Clinical Consequences
CYP2D6	*4/*41	INTERMEDIATE METABOLIZER	Consistent with a moderate deficiency in CYP2D6 enzyme activity.
CYP2C19	*1/*17	ULTRARAPID METABOLIZER	Consistent with an increased CYP2C19 enzyme activity. Exercise caution if CYP2C19 drug substrates are prescribed.
CYP2C9	*1/*1	EXTENSIVE (NORMAL) METABOLIZER	Consistent with normal CYP2C9 enzyme activity.
CYP3A4	*1/*22	INTERMEDIATE METABOLIZER	CYP3A4: Consistent with decreased CYP3A4 activity. CYP3A5: Consistent with an absence of CYP3A5 enzyme expression (Non-Expresser). This CYP3A5 phenotype is the most common in the general population. Overall CYP3A phenotype is consistent with decreased CYP3A complex activity. Caution is advised when prescribing narrow therapeutic index drugs. Alternative drugs or dose adjustment may be required if CYP3A inhibitors or inducers are co-prescribed.
CYP3A5	*3/*3		
SLCO1B1 521 T>C	521TT	NORMAL TRANSPORTER FUNCTION. NO INCREASE IN SIMVASTATIN MYOPATHY RISK.	Consistent with a normal SLCO1B1 transporter function.
VKORC1 1639G/T>A	GG	LOW WARFARIN SENSITIVITY	Consistent with a low sensitivity to Warfarin. See Phenotype Interpretation Section of the report for Warfarin dosing guidelinies.
FII(Prothrombin) 20210G>A	20210GG	NEGATIVE FOR 20210G>A MUTATION. NO INCREASED RISK FOR VENOUS THROMBOSIS (risk interpretation is based only on FII genotype)	NO INCREASED RISK FOR VENOUS THROMBOSIS
FV(Leiden) 1691G>A	1691GG	NEGATIVE FOR 1691G>A MUTATION. NO INCREASED RISK FOR VENOUS THROMBOSIS (risk interpretation is based only on FV genotype)	NO INCREASED RISK FOR VENOUS THROMBOSIS
MTHFR 677C>T 1298A>C	677TT 1298AA	INCREASED RISK OF HYPERHOMOCYSTEINEMIA	Patient's MTHFR genotype is associated with reduced folic acid conversion, elevated homocysteine levels, and methotrexate (and other anti-folate drug) toxicity.

Test Methodology: Array-based Qualitative Genotyping and Quantitative Copy Number Variation detection on the QuantStudio™ 7 Flex Platform. **Alleles Tested**: ; **CYP2D6** *2, *2A, *3, *4, *6, *7, *8, *9, *10, *12, *14, *17, *29, *41,*5 (gene deletion), XN (gene duplication); **CYP2C19** *2, *3, *4, *5, *6, *7, *8, *9, *17; **CYP2C9** *2, *3, *4, *5, *6, *11; **CYP3A4** *1B, *17, *22; **CYP3A5** *3, *6, *7, *8, *9; **Factor II** 20210G>A; **Factor V Leiden** 1691G>A; **MTHFR** 1298A>C, 677C>T; **SLCO1B1** 521T>C; **VKORC1** -1639G>A

Assay Limitation: Only the targeted genetic variants are detected. In the case of rare alleles that assay is not designed to detect, the genotype will default to wild type allele, or an allele that is most genetically similar. Test results do not rule out the possibility that this individual is a carrier of other mutations/variations not detected by Phamatech genotyping assays.

FDA Disclaimer: Genotyping assays were developed and their performance characteristics determined by Phamatech Inc. The tests have not been cleared by FDA. The FDA does not require clearance or approval for clinical laboratory developed tests. The laboratory is regulated under the Clinical Laboratory Improvement Act of 1988 as qualified to perform high complexity clinical testing.

Disclaimer: The report below is provided as supplementary information. It presents an interpretation of genetic results based on published commentary on clinical implementation of pharmacogenetic data. Dosing guidelines and recommendations provided in Patient Medication section are excerpts from FDA drug labels and dosing guidelines published by Clinical Pharmacogenetics Implementation Consortium (CPIC) or Dutch Pharmacogenetics Working Group (DPWC). Source of each recommendation is indicated. Phamatech does not take responsibility for dosing guidelines or recommendations that is provided as supplemental information. This report shall be used in conjunction with other clinical findings in guiding therapeutic approach for the patient. Phamatech does not and cannot prescribe or adviseany treatment for the patient. The treating healthcare professional has ultimate responsibility for all treatment decisions made with regard to the patient, including any made on the basis of the patient's genotype. Therefore, Phamatech and/or its employees, deny any liability to any person or entity with regard to claims, loss, damage arising, or alleged to arise, directly or indirectly, from the use of information contained in this report.

Phenotype Interpretation

CYP2D6 *4/*41 INTERMEDIATE METABOLIZER

This patient has one copy of a non-functional CYP2D6 allele and one copy of an allele encoding CYP2D6 protein with reduced activity. CYP2D6 gene duplication was not detected. Patient exhibits reduced CYP2D6 enzyme activity.
Prodrugs (i.e. Codeine, Tramadol, Oxycodone, Hydrocodone, Tamoxifen): The conversion of prodrugs metabolized by CYP2D6 to their active metabolites is reduced. Patient may experience inadequate or attenuated therapeutic effect when treated with a prodrug due to active metabolite not reaching the therapeutic dose. If efficacy problems occur, consider selecting an alternative medication not metabolized through CYP2D6 pathway.
Drugs deactivated by CYP2D6: Patient may develop higher serum concentration of drug due to decreased drug clearance. Patient is at increased risk of concentration-dependent adverse drug reactions, drug toxicity or prolonged therapeutic effect. If safety (ADRs) problems occur, consider dose decrease or alternative medication that is not metabolized through CYP2D6 pathway. CYP2D6 inhibitors further decrease CYP2D6 enzymatic activity. Be extra cautious when prescribing CYP2D6 substrate to a patient who is concurrently taking CYP2D6 inhibiters. Further dose adjustment may be required in such case. If medication is metabolized by multiple CYPs (i.e. CYP3A4/5, CYP2C19), be aware of patient's metabolizing status and co-administered inducers/inhibitors for any of the major participating CYPs.

CYP2D6 SUBSTRATES (this list is not all inclusive):

Opioids: Codeine (Prodrug), Tramadol (Prodrug), Oxycodone (Prodrug). Psychiatry: Thioridazine, Zuclopenthixol. Antidepressants: Amitriptyline, Clomipramine, Desipramine, Doxepin, Imipramine, Nortriptyline, Trimipramine. Cardiovascular: Flecainide, Metoprolol, Propafenone. Cancer treatment: Tamoxifen (Prodrug).

Opioids: Hydrocodone (Prodrug). Psychiatry: Aripiprazole, Benztropine, Chlorpromazine, Cevimeline, Clozapine, Donepezil, Dextromethorphan, Fluphenazine, Galantamine, Haloperidol, Iloperidone, Modafinil, Olanzapine, Perphenazine, Pimozide, Risperidone, Tetrabenazine. Antidepressants: Atomoxetine, Citalopram, Duloxetine, Escitalopram, Fluoxetine, Fluvoxamine, Mirtazapine, Paroxetine, Sertaline, Venlafaxine, Vortioxetine. Cardiovascular: Alprenolol, Bufuralol, Carvediol, Clonidine, Debrisoquine, Mexiletine, Nebivolol, Perhexiline, Propranolol, Sparteine, Timolol. Antihistamines: Chlorphenamine, Diphenhydramine, Hydroxyzine. Anti-diabetic: Phenformin. Anti-nausea: Metoclopramide, Ondansetron, Promethazine.

CYP2D6 INHIBITORS: Strong inhibitors: Bupropion, Fluoxetine, Paroxetine, Quinidine. Moderate inhibitors: Cinacalcet, Duloxetine, Terbinafine. Weak Inhibitors: Amiodarone, Celecoxib, Cimetidine, Desvenlafaxine, Diltiazem, Diphenhydramine, Echinacea (herbal), Escitalopram, Febuxostat, Gefitinib, Hydralazine, Hydroxychloroquine, Imatinib, Methadone, Oral contraceptives, Propafenone, Ranitidine, Ritonavir, Sertraline, Telithromycin, Verapamil. **CYP2D6 INDUCERS:** None known.

CYP2C19	***1/*17**	**ULTRARAPID METABOLIZER: USE CAUTION**

This patient has one copy of a normal activity allele and one copy of an allele with increased expression of CYP2C19 gene. Patient exhibits higher than normal CYP2C19 enzyme activity.
Prodrugs (i.e. Clopidogrel): The conversion of prodrugs metabolized by CYP2C19 to their active metabolites is increased, which may lead to increased risk of concentration-dependent side effects.

Drugs deactivated by CYP2C19: Metabolism of drugs that are substrates for CYP2C19 is increased. Patients should be monitored for signs and symptoms associated with lack of efficacy. Higher doses may be required to achieve an adequate therapeutic response. Consult clinical guidelines and utilize therapeutic drug monitoring for dose adjustment.

CYP2C19 SUBSTRATES (this list is not all inclusive):

Antidepressants: Amitriptyline, Citalopram, Clomipramine, Doxepin, Escitalopram, Imipramine, Sertraline, Trimipramine. Proton Pump Inhibitors: Esomeprazole, Lansoprazole, Omeprazole, Pantoprazole.

Cardiovascular: Clopidogrel (Prodrug), Propranolol. Opioids: Meperidine, R-Methadone. NSAIDs: Indomethacin. Muscle relaxants: Carisoprodol. Psychiatry: Diazepam, Hexobarbital, Mephenytoin, Mephobarbital, Phenobarbital, Phenytoin, Primidone. Antidepressants: Moclobemide. Proton Pump Inhibitors: Dexlansoprazole, Rabeprazole. HIV treatment: Nelfinavir. Antibiotics/Antifungal: Chloramphenicol, Voriconazole. Antimalarial: Proguanil (Prodrug).

CYP2C19 INHIBITORS: Strong inhibitors: Fluconazole, Fluvoxamine, Ticlopidine. Moderate inhibitors: Esomeprazole, Fluoxetine, Moclobemide, Omeprazole, Voriconazole. Weak Inhibitors: Allicin (garlic derivative), Armodafinil, Carbamazepine, Cimetidine, Etravirine, Human growth hormone (rhGH), Felbamate, Ketoconazole, Oral contraceptives. **CYP2C19 INDUCERS:** Rifampin, Artemisinin.

CYP2C9	***1/*1**	**EXTENSIVE (NORMAL) METABOLIZER**

This patient carries two copies of normal activity CYP2C9 allele. Patient is anticipated to have normal CYP2C9 enzyme activity. Consider following standard dosing practices when prescribing CYP2C9 metabolized drugs. Note that inhibitors and inducers of CYP2C9 may change patient's metabolizing status. This patient carries two copies of normal activity CYP2C9 allele. Patient is anticipated to have normal CYP2C9 enzyme activity. Consider following standard dosing practices when prescribing CYP2C9 metabolized drugs. Note that inhibitors and inducers of CYP2C9 may change patient's metabolizing status.

CYP2C9 SUBSTRATES (this list is not all inclusive):

Cardiovascular: Acenocoumarol, Candesartan, Irbesartan, Losartan (Prodrug), Phenprocoumone, Torsemide, Valsartan, Warfarin. Statins: Fluvastatin; Pulmonology: Bosentan. NSAIDs: Aceclofenac, Celecoxib*, Diclofenac, Flurbiprofen, Naproxen, Ibuprofen, Indomethacin, Lornoxicam, Mefenamic acid, Meloxicam, Piroxicam, Tenoxicam, Valdecoxib. Psychiatry: Fluoxetine, Phenytoin. Anti-diabetic: Glibenclamide, Glimepiride, Gliclazide, Tolbutamide, Nateglinide. Steroids: Mestranol (Prodrug)

CYP2C9 INHIBITORS: Moderate inhibitors: Amiodarone, Fluconazole, Miconazole, Oxandrolone. Weak Inhibitors: Capecitabine, Cotrimoxazole, Etravirine, Fluvastatin, Fluvoxamine, Metronidazole, Sulfinpyrazone, Tigecycline, Voriconazole, Zafirlukast.
CYP2C9 INDUCERS: Carbamazepine, Rifampin, Aprepitant, Bosentan, Phenobarbital, St. John's Wort.

CYP3A4	***1/*22**	**INTERMEDIATE METABOLIZER**	**CYP3A4/5: INTERMEDIATE METABOLIZER**
CYP3A5	***3/*3**	**NORMAL 3A5 NON-EXPRESSER**	

The patient is anticipated to have decreased levels of CYP3A4/5 enzyme activity. Patient may exhibit decreased drug clearance and develop side effects from standard doses of CYP3A substrates. Be alert to adverse drug reactions and use caution when prescribing CYP3A4 metabolized drugs, especially drugs with narrow therapeutic window (Alfentanil, Cyclosporine, Dihydroergotamine, Ergotamine, Fentanyl, Pimozide, Quinidine, Sirolimus, Tacrolimus).

CYP3A4/5 SUBSTRATES (this list is not all inclusive):

Cardiovascular: Amlodipine, Conivaptan, Dronedarone, Eplerenone, Felodipine, Ivabradine, Lercanidipine, Nicardipine, Nifedipine, Nimodipine, Nisoldipine, Nitrendipine, Ticagrelol, Tolvaptan, Vesnarinone. Statins: Atorvastatin, Lovastatin, Simvastatin. Psychiatry: Aripiprazole, Buspirone, Dihydroergotamine, Eletripan, Estazolam, Ergotamine, Lurasidone, Midazolam, Nitrazepam, Pimozide, Risperidone, Quetiapine, Triazolam, Zonisamide. Antidepressants: Amitriptyline, Clomipramine, Doxepin, Imipramine, Mirtazapine, Nefazodone, Reboxetine, Trazadone, Trimipramine, Venlafaxine. Opioids: Alfentanil, Codeine, Fentanyl,

Hydrocodone, Meperidine, Methadone, Propoxyphene, Tramadol, Sufentanil. Steroids: Budesonide, Cortisol, Estradiol, Gestrodene, Hydrocortisone, Fluticasone. Proton Pump Inhibitors: Esomeprazole, Lansoprazole, Omeprazole, Pantoprazole. Immunosupressants: Cyclosporin, Everolimus, Sirolimus, Tacrolimus. Cancer treatment: Cabazitaxel, Dasatinib, Gefitinib, Ruxolitinib, Sunitinib, Tamoxifen . Antibiotics/antifungals: Clarithromycin, Dirithromycin, Erythromycin, Telithromycin, Voriconazole,Posaconazole. Anti-nausea: Aprepitant, Granisetron. HIV treatment: Amprenavir, Darunavir, Fosamprenavir, Indinavir, Nelfinavir, Ritonavir, Tipranavir, Lopinavir, Maraviroc, Saquinavir. Others: Sildenafil (Viagra), Vardenafil (Levitra).

CYP3A INHIBITORS: Strong inhibitors: Boceprevir, Clarithromycin, Conivaptan, Grapefruit juice, Indinavir, Itraconazole, Ketoconazole, Lopinavir/ritonavir, Mibefradil, Nefazodone, Nelfinavir, Posaconazole, Ritonavir, Saquinavir, Telaprevir, Telithromycin, Voriconazole. Moderate inhibitors: Amprenavir, Aprepitant, Atazanavir, Ciprofloxacin, Darunavir/ritonavir, Diltiazem, Erythromycin, Fluconazole, Fosamprenavir, Imatinib, Verapamil. Weak Inhibitors: Alprazolam, Amiodarone, Amlodipine, Atorvastatin, Bicalutamide, Cilostazol, Cimetidine, Cyclosporine, Fluoxetine, Fluvoxamine, Ginkgo, Goldenseal, Isoniazid, Nilotinib, Oral contraceptives, Ranitidine, Ranolazine, Tipranavir/ritonavir, Zileuton. **CYP3A INDUCERS:** Avasimibe, Carbamazepine, Phenytoin, Rifampin, St. John's wort, Bosentan, Efavirenz, Etravirine, Modafinil, Nafcillin, Amprenavir, Aprepitant, Armodafinil, Echinacea, Pioglitazone, Prednisone, Rufinamide.

SLCO1B1	**521TT**	**NORMAL TRANSPORTER FUNCTION. NO INCREASE IN SIMVASTATIN MYOPATHY RISK.**

SLCO1B1 SUBSTRATES (this list is not all inclusive):

Statins: Atorvastatin, Lovastatin, Pitavastatin, Pravastatin, Rosuvastatin, Simvastatin. Cardiovascular: Bosentan, Enalapril, Olmesartan, Valsartan. Antibiotics/Antifungal: Benzylpenicillin, Caspofungin, Rifampin. Cancer treatment: Methotrexate, SN-38 (active metabolite of irinotecan). Anti-diabetic: Glyburide, Repaglinide.
SLCO1B1 INHIBITORS: Atazanavir, Cyclosporine, Eltrombopag, Gemfibrozil, Lopinavir, Rifampin, Ritonavir, Saquinavir, Tipranavir.

VKORC1	**GG**	**LOW WARFARIN SENSITIVITY**

This patient has VKORC1 GG genotype (negative for -1639 G/T>A mutation). The VKORC1 gene encodes the Vitamin K epoxide reductase protein, which is a molecular target of warfarin. For warfarin dosing, consider using the online resource http://www.warfarindosing.org or the table below.

Note that hereditary or acquired deficiency of protein C or its cofactor, protein S, has been associated with tissue necrosis following administration of warfarin.

Warfarin Drug Label: Range of Expected Therapeutic Warfarin Doses Based on CYP2C9 and VKORC1 Genotypes

VKORC1	CYP2C9					
	*1/*1	*1/*2	*1/*3	*2/*2	*2/*3	*3/*3
GG	5-7 mg	5-7 mg	3-4 mg	3-4 mg	3-4 mg	0.5-2 mg
AG	5-7 mg	3-4 mg	3-4 mg	3-4 mg	0.5-2 mg	0.5-2 mg
AA	3-4 mg	3-4 mg	0.5-2 mg	0.5-2 mg	0.5-2 mg	0.5-2 mg

Other clinical factors (e.g., age, race, body weight, sex, concomitant medications, and comorbidities) are generally accounted for along with genotype in the ranges expressed in the Table. VKORC1 1639 G/T>A variant is used in this table. Other co-inherited VKORC1 variants may also be important determinants of warfarin dose. Patients with CYP2C9 *1/*3, *2/*2, *2/*3 and *3/*3 may require more prolonged time (>2 to 4 weeks) to achieve maximum INR effect for a given dosage regimen.

FII	**20210GG**	**NEGATIVE FOR 20210G>A MUTATION. NO INCREASED RISK FOR VENOUS THROMBOSIS (risk interpretation is based only on FII genotype)**

This patient is negative for FII (Prothrombin) gene mutation 20210G>A. Venous thrombosis is multifactorial and person who experienced thrombotic event may carry a risk factor for recurrent thrombosis even if found to be negative for factor II 20210G>A mutation. Consideration should be given to factor V Leiden DNA testing, biochemical measurement of plasma homocysteine, and functional coagulation assays for antithrombin III, protein C, and protein S.

FV	**1691GG**	**NEGATIVE FOR 1691G>A MUTATION. NO INCREASED RISK FOR VENOUS THROMBOSIS (risk interpretation is based only on FV genotype)**

This patient is negative for factor V Leiden mutation. Person who experienced thrombotic event may carry a risk factor for recurrent thrombosis even if found to be negative for factor V Leiden*. Venous thrombosis is multifactorial, and the presence of more than one genetic risk factor is not uncommon. Consideration should be given to supplementing factor V Leiden DNA testing with factor II (prothrombin) DNA testing, biochemical measurement of plasma homocysteine, and functional coagulation assays for antithrombin III, protein C, and protein S.
* Grody WW, et al. (2007) American College of Medical Genetics Consensus Statement on Factor V Leiden Mutation Testing

MTHFR	**677TT 1298AA**	**INCREASED RISK OF HYPERHOMOCYSTEINEMIA**

MTHFR catalyzes conversion of folate to its major active form which is involved in neurotransmitter synthesis, conversion of homocysteine to methionine, and is important for cardiovascular health and normal nervous system function. This patient carries two 677C>T mutations (homozygous) of MTHFR gene and is negative for 1298A>C mutation. Patient's MTHFR genotype is associated with reduced folic acid conversion and increased risk of depressive episodes*. Patient's MTHFR genotype is

associated with elevated homocysteine levels, and methotrexate (and other anti-folate drug) toxicity**. There is currently no evidence of increased risk for venous thromboembolism or recurrent pregnancy loss in patients homozygous for the 677C>T mutation who have normal plasma homocysteine levels. Patients homozygous for the 677C>T mutation with elevated homocysteine may be at increased risk for both of these events (venous thromboembolism odds ratio 1.27 and recurrent pregnancy loss pooled risk 2.7). Women homozygous for 677C>T should be counseled that they have a modestly increased risk (odds ratio 1.6) to have offspring with a neural tube defect. This risk is increased further if the fetus is also homozygous***.

* Kelly CB et al., J Psychopharmacol. (2004) 18(4):567-71
**Song GG et al., Clin Rheumatol (2014) 33(12):1715-24
***Hickey SE et al, ACMG Practice Guidelines Genet Med 2013:15(2):153-156

Legend

Normal phenotype. Follow standard dosing practices or treatment regimen.

Increased risk for the indicated condition. Medications that are substrates to the listed pathway have potentially reduced efficacy or increased toxicity. Clinical monitoring is recommended.

Guidelines exist for adjusting dasage or selection of alternative medication. Consult FDA drug label and/or www.pharmgkb.org for published clinical guidelines and treatment adjustments.

Personalized Drug Metabolism Chart

Medical Specialty	Medication	Brand Name	CYP2D6	CYP2C19	CYP3A4/5	CYP2C9	SLCO1B1
PAIN MANAGEMENT	**Opioids**						
⚠	Alfentanil	Alfenta			DECREASED		
⚠	Buprenorphine	Buprenex, Suboxone, Subutex			DECREASED		
✓	Butorphanol						
!	Codeine (Prodrug)	Tylenol#3. Tylenol#4	DECREASED		DECREASED		
⚠	Dihydrocodeine (Prodrug)	Synalgos, Novocodin, Drocode, Parzone	DECREASED		DECREASED		
⚠	Fentanyl	Duragesic, Actiq			DECREASED		
⚠	Hydrocodone (Prodrug)	Vicodin, Hydrocet, Norco, Lortab, Lorcet	DECREASED		DECREASED		
✓	Hydromorphone	Dilaudid, Hydrostat, Exalgo					
✓	Levorphanol	Levo Dromoran					
⚠	Loperamide	Imodium			DECREASED		
⚠	Methadone	Dolophine, Methadose		INCREASED	DECREASED		
⚠	Meperidine	Demerol			DECREASED		
✓	Morphine	MSContin, Avinza, Roxanol, Oramorph					
✓	Oxymorphone	Opana, Numorphan, Numorphone					
!	Oxycodone (Prodrug)	Percocet, OxyContin	DECREASED		DECREASED		
⚠	Propoxyphene	Darvon			DECREASED		
⚠	Sufentanil	Sufenta			DECREASED		
✓	Tapentadol	Nucynta, Palexia					
!	Tramadol (Prodrug)	Ultram, Ryzolt, ConZip	DECREASED		DECREASED		
	Opioid Receptor Antagonists						
✓	Naloxone	Narcan, Evzio					
✓	Naltrexone	Revia					
	NSAIDs						
✓	Aceclofenac	Acebid, Nofenac				NORMAL	
✓	Acetaminophen	Tylenol					
✓	Aspirin	Ecotrin					
✓	Celecoxib	Celebrex				NORMAL	
✓	Diclofenac	Voltaren				NORMAL	
✓	Etodolac	Lodine				NORMAL	
✓	Fenoprofen	Nalfon					

Personalized Drug Metabolism Chart

Medical Specialty	Medication	Brand Name	CYP2D6	CYP2C19	CYP3A4/5	CYP2C9	SLCO1B1
PAIN MANAGEMENT	**NSAIDs**						
	Flurbiprofen	Ansaid				NORMAL	
	Ibuprofen	Advil				NORMAL	
	Indomethacin	Indocin		INCREASED		NORMAL	
	Ketoprofen	Orudis, Oruvail, Actron				NORMAL	
	Ketorolac	Toradol					
	Lornoxicam	Zornica				NORMAL	
	Mefenamic acid	Ponstel				NORMAL	
	Meloxicam	Mobic				NORMAL	
	Naproxen	Aleve, Naprosyn, Anaprox, Naprelan				NORMAL	
	Nabumetone	Relafen					
	Oxaprozin	Daypro				NORMAL	
	Piroxicam	Feldene				NORMAL	
	Sulindac	Clinoril					
	Tenoxicam	Oxicam, Tilcotil				NORMAL	
	Valdecoxib	Bextra			DECREASED	NORMAL	
	Muscle Relaxants						
	Baclofen	Lioresal					
	Carisoprodol	Soma		INCREASED			
	Cyclobenzaprine	Flexeril, Amrix	DECREASED		DECREASED		
	Chlorzoxarone	Lorzone, Parafon, Paraflex, Relaxazone					
	Metaxalone	Skelaxin	DECREASED		DECREASED		
	Methocarbamol	Robaxin					
	Oxybutynin	Ditropan XL, Urotrol			DECREASED		
	Orphenadrine	Norflex, Norgesic			DECREASED		
	Tizanidine	Zanaflex					
	Antidepressants						
	Amitriptyline	Amitril, Elavil, Endep	DECREASED	INCREASED	DECREASED		
	Amoxapine	Asendin	DECREASED				
	Bupropion	Wellbutrin, Zyban, Aplenzin, Forfivo XL					
	Buspirone	Buspar			DECREASED		
	Citalopram	Celexa	DECREASED	INCREASED	DECREASED		

Personalized Drug Metabolism Chart

Medical Specialty	Medication	Brand Name	CYP2D6	CYP2C19	CYP3A4/5	CYP2C9	SLCO1B1
PSYCHIATRY / NEUROLOGY	**Antidepressants**						
	Clomipramine	Anafranil	DECREASED	INCREASED	DECREASED		
	Desipramine	Norpramin	DECREASED		DECREASED		
	Doxepin	Silenor, Sinequan	DECREASED	INCREASED	DECREASED		
	Duloxetine	Cymbalta	DECREASED				
	Fluoxetine	Prozac, Symbyax	DECREASED		DECREASED	NORMAL	
	Fluvoxamine	Luvox, Luvox CR	DECREASED				
	Escitalopram	Lexapro		INCREASED	DECREASED		
	Imipramine	Tofranil, Tofranil-PM	DECREASED	INCREASED	DECREASED		
	Levomilnacipran	Fetzima			DECREASED		
	Moclobemide	Aurorix	DECREASED	INCREASED			
	Milnacipran	Savella					
	Mirtazapine	Remeron	DECREASED		DECREASED		
	Nortriptyline	Aventyl, Pamelor	DECREASED		DECREASED		
	Paroxetine	Brisdelle, Paxil, Pexeva	DECREASED				
	Reboxetine	Edronax, Norebox, Solvex, Davedax			DECREASED		
	Sertraline	Zoloft		INCREASED	DECREASED		
	Symbyax	Symbyax	DECREASED				
	Trazodone	Desyrel, Oleptro			DECREASED		
	Trimipramine	Surmontil	DECREASED	INCREASED			
	Venlafaxine	Effexor XR	DECREASED		DECREASED		
	Vilazodone	Viibryd			DECREASED		
	Vortioxetine	Brintellix	DECREASED		DECREASED		
	ADHD treatment						
	Amphetamine	Adderall	DECREASED				
	Dextroamphetamine	Dexedrine	DECREASED				
	Lisdexamfetamine	Vyvanse	DECREASED				
	Methylphenidate	Concerta, Ritalin					
	Dexmethylphenidate	Focalin					
	Atomoxetine	Strattera	DECREASED	INCREASED			
	Clonidine	Catapres, Kapvay	DECREASED				

Personalized Drug Metabolism Chart

Medical Specialty	Medication	Brand Name	CYP2D6	CYP2C19	CYP3A4/5	CYP2C9	SLCO1B1
PSYCHIATRY / NEUROLOGY	**ADHD treatment**						
△	Guanfacine	Intuniv			DECREASED		
✓	Buproprion	Wellbutrin					
	Benzodiazepines						
△	Alprazolam	Xanax			DECREASED	NORMAL	
△	Bromazepam	Bromazanil, Dormoc, Lexotanil, Normoc		INCREASED	DECREASED		
△	Clobazam	Frisium		INCREASED	DECREASED		
△	Clonazepam	Klonopin			DECREASED		
△	Diazepam	Valium, Diastat		INCREASED	DECREASED		
△	Estazolam	ProSom, Eurodin			DECREASED		
△	Flurazepam	Dalmane, Dalmadorm			DECREASED		
✓	Lorazepam	Ativan					
△	Midazolam	Meberal			DECREASED		
△	Medazepam	Nobrium, Tranquirax, Rudotel, Raporan		INCREASED	DECREASED		
△	Nitrazepam	Serzone			DECREASED		
△	Oxazepam	Serax			DECREASED		
△	Quazepam	Doral, Dormali		INCREASED	DECREASED	NORMAL	
△	Prazepam	Centrax, Dementrin			DECREASED		
△	Temazepam	Restoril		INCREASED	DECREASED		
△	Triazolam	Mellaril, Sonopax			DECREASED		
	Sedatives-hypnotics						
△	Eszopiclone	Lunesta			DECREASED	NORMAL	
△	Zolpidem	Ambien			DECREASED		
	Antipsychotics						
△	Aripiprazole	Abilify	DECREASED		DECREASED		
△	Chlorpromazine	Thorazine	DECREASED				
△	Clozapine	Clozaril, Verzacloz	DECREASED		DECREASED		
△	Fluphenazine	Prolixin	DECREASED				
△	Haloperidol	Haldol	DECREASED		DECREASED		
△	Iloperidone	Fanapt	DECREASED		DECREASED		
△	Lurasidone	Latuda			DECREASED		
△	Olanzapine and fluoxetine*	Symbyax	DECREASED				
△	Paliperidone	Invega	DECREASED		DECREASED		

Personalized Drug Metabolism Chart

Medical Specialty	Medication	Brand Name	CYP2D6	CYP2C19	CYP3A4/5	CYP2C9	SLCO1B1
PSYCHIATRY / NEUROLOGY	**Antipsychotics**						
⚠	Perphenazine	Etrafon	DECREASED		DECREASED		
⚠	Pimozide	Orap	DECREASED		DECREASED		
⚠	Quetiapine	Seroquel, Seroquel XR			DECREASED		
⚠	Risperidone	Risperdal	DECREASED				
⚠	Tetrabenazine	Xenazine	DECREASED				
❗	Thioridazine	Halcion	DECREASED				
⚠	Ziprasidone	Geodon			DECREASED		
❗	Zuclopenthixol	Clopixol	DECREASED				
	Barbiturates						
⚠	Hexobarbital	Barbidorm		INCREASED		NORMAL	
⚠	Mephobarbital	Versed		INCREASED			
⚠	Phenobarbital	Luminal		INCREASED		NORMAL	
	Anticonvulsants						
⚠	Carbamazepine	Tegretol, Carbatrol			DECREASED		
✓	Gabapentin	Neurontin					
✓	Lamotrigine	Lamictal					
⚠	Mephenytoin	Mesantoin		INCREASED		NORMAL	
⚠	Phenytoin	Dilantin		INCREASED		NORMAL	
✓	Pregabalin	Lyrica					
⚠	Primidone	Mysoline		INCREASED			
✓	Rufinamide	Banzel					
⚠	Zonisamide	Zonegran			DECREASED		
	Treatment Of Alzheimer's						
⚠	Donepezil	Aricept	DECREASED		DECREASED		
⚠	Galantamine	Razadyne	DECREASED		DECREASED		
✓	Memantine	Namenda					
	Treatment Of Migraine						
⚠	Ergotamine	Replax			DECREASED		
⚠	Dihydroergotamine	Migranal, D.H.E 45			DECREASED		
⚠	Eletriptan	Relpax			DECREASED		
	Other Medications Used In Neurology						
⚠	Benzatropine	Cogentin	DECREASED	INCREASED			
⚠	Cevimeline	Evoxac	DECREASED		DECREASED		
⚠	Modafinil	Alertec, Provigil	DECREASED		DECREASED		

Personalized Drug Metabolism Chart

Medical Specialty	Medication	Brand Name	CYP2D6	CYP2C19	CYP3A4/5	CYP2C9	SLCO1B1
	Other Medications Used In Neurology						
	NUEDEXTA	NUEDEXTA	DECREASED		DECREASED		
	Tetrabenazine	Xenazine	DECREASED				
CARDIOLOGY	**Antiarrhythmics**						
	Amiodarone	Cordarone			DECREASED		
	Bretylium						
	Dofetilide	Tikosyn			DECREASED		
	Dronedarone	Multaq			DECREASED		
	Flecainide	Tambocor	DECREASED				
	Ibutilide	Corvert					
	Lidocaine	Xylocaine			DECREASED		
	Mexiletine	Mexitil	DECREASED		DECREASED		
	Propafenone	Rythmol	DECREASED		DECREASED		
	Quinidine	Quinidex			DECREASED		
	Sotalol	Betapace					
	Sparteine	Spal	DECREASED				
	Cardiac Glycosides						
	Digitoxin	Digibind			DECREASED		
	Digoxin	Digitek, Lanoxin			DECREASED		
	Antianginal						
	Ivabradine	Bradid, Ceralan			DECREASED		
	Perhexiline	Pexsig	DECREASED				
	Ranolazine	Ranexa	DECREASED		DECREASED		
	Hypotensives: Beta Blockers						
	Alprenolol	Atenenol	DECREASED				
	Atenolol	Tenormin					
	Carvedilol	Coreg	DECREASED			NORMAL	
	Metoprolol	Lopressor, Toprol XL	DECREASED				
	Nadolol	Corgard					
	Nebivolol	Bystolic	DECREASED				
	Propranolol	Inderal, Inderal LA	DECREASED				
	Timolol	Blocarden	DECREASED				
	Hypotensives: Calcium Channel Blockers						
	Amlodipine	Norvasc			DECREASED		
	Diltiazem	Cardizem, Tiazac			DECREASED		

Personalized Drug Metabolism Chart

Medical Specialty	Medication	Brand Name	CYP2D6	CYP2C19	CYP3A4/5	CYP2C9	SLCO1B1
CARDIOLOGY	**Hypotensives: Calcium Channel Blockers**						
	Felodipine	Plendil			DECREASED		
	Lercanidipine	Landip, Larpin, Lerka			DECREASED		
	Mibefradil	Posicor			DECREASED		
	Nifedipine	Adalat, Procardia			DECREASED		
	Nimodipine	Nimotop, Nymalize			DECREASED		
	Nisoldipine	Sular			DECREASED		
	Nitrendipine	Balodopine			DECREASED		
	Verapamil	Calan, Verelan, Calan SR, Isoptin			DECREASED	NORMAL	
	Ace Inhibitors						
	Benazepril	Lotensin					
	Captopril	Capoten	DECREASED				
	Enalapril	Vasotec			DECREASED		NORMAL
	Lisinopril	Privinil					
	Moexipril	Univasc					
	Perindopril	Aceon					
	Quinapril	Accupril					
	Ramipril	Altace					
	Trandolapril	Mavik, Tarka					
	Angiotensin Ii Receptor Blockers						
	Candesartan	Atacand				NORMAL	
	Eprosartan	Teveten					
	Irbesartan	Avapro				NORMAL	
	Losartan (Prodrug)	Cozaar				NORMAL	
	Olmesartan	Olmetec					NORMAL
	Telmisartan	Micardis					
	Valsartan	Diovan				NORMAL	NORMAL
	Other Hypotensives						
	Aliskiren	Tekturna					
	Bosentan	Trasleer			DECREASED	NORMAL	NORMAL
	Clonidine	Catapres-TTS, Jenloga	DECREASED				
	Conivaptan	Vaprisol			DECREASED		
	Debrisoquine	Declinax	DECREASED				

Personalized Drug Metabolism Chart

Medical Specialty	Medication	Brand Name	CYP2D6	CYP2C19	CYP3A4/5	CYP2C9	SLCO1B1
CARDIOLOGY	**Other Hypotensives**						
	Eplerenone	Inspra			DECREASED		
	Tolvaptan	Samsca			DECREASED		
	Antiplatelet Agents						
	Clopidogrel (Prodrug)	Plavix		INCREASED			
	Prasugrel (Prodrug)	Effient			DECREASED	NORMAL	
	Ticagrelor	Brilinta			DECREASED		
	Anticoagulant Therapy						
	Acenocoumarol	Sintrom, Sinthrome		INCREASED		NORMAL	
	Apixaban	Eliquis			DECREASED		
	Dabigatran	Pradaxa					
	Fondaparinux	Arixtra					
	Phenprocoumon	Marcoumar, Marcumar			DECREASED	NORMAL	
	Rivaroxaban	Xarelto			DECREASED		
	Warfarin	Coumadine				NORMAL	
	Diuretics						
	Indapamide	Lozide	DECREASED		DECREASED	NORMAL	
	Furosemide	Lasix					
	Metolazone	Zaroxolyn					
	Spironolactone	Aldactone					
	Torsemide	Demadex				NORMAL	
	Statins						
	Atorvastatin	Lipitor, Torvast			DECREASED		NORMAL
	Fluvastatin	Lescol, Lescol XL				NORMAL	
	Lovastatin	Mevacor, Lescol, Advicor			DECREASED		NORMAL
	Pitavastatin	Livalo, Pitava					NORMAL
	Pravastatin	Pravachol, Selektine, Lipostat					NORMAL
	Rosuvastatin	Crestor					
	Simvastatin	Zocor, Lipex, Simcor			DECREASED		NORMAL
GASTRO-ENTROLOGY	**Proton Pump Inhibitors**						
	Dexlansoprazole	Dexilant, Kapidex		INCREASED			
	Esomeprazole	Nexium		INCREASED	DECREASED		
	Lansoprazole	Prevacid		INCREASED	DECREASED		
	Omeprazole	Prilosec		INCREASED	DECREASED		
	Pantoprazole	Protonix		INCREASED	DECREASED		

Personalized Drug Metabolism Chart

Medical Specialty	Medication	Brand Name	CYP2D6	CYP2C19	CYP3A4/5	CYP2C9	SLCO1B1
GASTRO-ENTROLOGY	**Proton Pump Inhibitors**						
△	Rabeprazole	Aciphex		INCREASED			
ENDOCRINOLOGY	**Insulin Secretagogues**						
✓	Gliclazide					NORMAL	
✓	Glimepiride	Amaryl				NORMAL	
✓	Glipizide	Glucotrol				NORMAL	
✓	Glyburide	Diabeta, Glynase				NORMAL	NORMAL
△	Nateglinide	Starlix			DECREASED	NORMAL	
△	Repaglinide	Prandin, NovoNorm			DECREASED	NORMAL	NORMAL
✓	Tolbutamide					NORMAL	
	Insulin Sensitizers						
✓	Metformin	Glucophage					
✓	Rosiglitazone	Avandia				NORMAL	
△	Pioglitazone	Actos			DECREASED		
UROLOGY	**Bph Drugs**						
△	Alfuzosin	Uroxatral			DECREASED		
△	Doxazosin	Cardura	DECREASED		DECREASED	NORMAL	
△	Dutasteride	Avodart			DECREASED		
✓	Finasteride	Proscar					
△	Silodosin	Rapaflo			DECREASED		
△	Tamsulosin	Flomax	DECREASED		DECREASED		
△	Terazosin	Hytrin			DECREASED		
	Urinary Antispasmodics						
△	Darifenacin	Enablex	DECREASED		DECREASED		
△	Fesoterodine	Toviaz	DECREASED		DECREASED		
△	Oxybutynin	Ditropan XL, Urotrol			DECREASED		
△	Solifenacin	Vesicare			DECREASED		
△	Tolterodine	Detrol	DECREASED		DECREASED		
✓	Trospium	Sanctura					
	Phosphodiesterase-5 Inhibitors (treatment Of Erectile Dysfunction)						
△	Sildenafil	Viagra			DECREASED	NORMAL	
△	Tadalafil	Levitra			DECREASED		
△	Vardenafil	Avodart			DECREASED		

INCREASED	ULTRARAPID METABOLIZER or ULTRARAPID TO NORMAL METABOLIZER		MEDICATION WITH LOW GENETIC IMPACT. USE STANDARD PRECAUTIONS
DECREASED	INTERMEDIATE METABOLIZER or INTERMEDIATE TO NORMAL METABOLIZER or DECREASED ABCB1 TRANSPORTER ACTIVITY		MEDICATION WITH MODERATE GENETIC IMPACT. NO PUBLISHED DOSING GUIDELINES AVAILABLE.USE THERAPEUTIC MONITORING
NORMAL	EXTENSIVE (NORMAL) METABOLIZER or NORMAL ABCB1 TRANSPORTER ACTIVITY		DOSING GUIDELINES EXIST FOR THIS MEDICATION. CONSULT FDA LABEL OR www.pharmgkb.org FOR TREATMENT ADJUSTMENT
LOW	POOR METABOLIZER	**NOTE:** Medications metabolized by multiple enzymes are expected to be less sensitive to effect of genetic markers. The chart only includes genotype information on major drug metabolizing enzymes/transporters for which testing is available. Note that listed drugs may undergo metabolism via additional metabolic pathways. This chart is based on information frompharmacokinetic databases www.drugbank.ca, www.pharmgkb.org, and published research.	

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Patient: **DOB:**

Gene	Genotype	Phenotype
CYP2D6	*4/*41	INTERMEDIATE METABOLIZER
CYP2C19	*1/*17	ULTRARAPID METABOLIZER
CYP2C9	*1/*1	EXTENSIVE (NORMAL) METABOLIZER
CYP3A4/5	*1/*22 *3/*3	INTERMEDIATE METABOLIZER
SLCO1B1	521TT	NORMAL TRANSPORTER FUNCTION. NO INCREASE IN SIMVASTATIN MYOPATHY RISK.
VKORC1	GG	LOW WARFARIN SENSITIVITY
FII	20210GG	NEGATIVE FOR 20210G>A MUTATION. NO INCREASED RISK FOR VENOUS THROMBOSIS (risk interpretation is based only on FII genotype)
FV	1691GG	NEGATIVE FOR 1691G>A MUTATION. NO INCREASED RISK FOR VENOUS THROMBOSIS (risk interpretation is based only on FV genotype)
MTHFR	677TT	INCREASED RISK OF HYPERHOMOCYSTEINEMIA
	1298AA	