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Genetic Testing for Guided Medications

CLS PGx Research Review

Presented here are the results of the Coriell Life Sciences systematic review of available guidance and research literature. The CLS PGx Research Review is a general purpose research assistance service intended to provide users with relevant medical reference information related to identified gene variations and their drug associations. This research review reflects the professional opinions of the CLS research team, and are intended solely for general purpose research use and are not intended for use in clinical diagnosis or treatment. Independent review of the same evidence can be performed, with referenced sources documented at https://www.informeddna.com/references.

Patient: Doe, John
Date of Birth: 01/01/1980

Sample ID: 000000

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Genetic Research Summary Information

† Key: Indeterminant, Uncertain = No known diplotype or activity; Negative = wild type alleles; Positive = heterozygous or homozygous alleles; n/a = no gene information available.

Genetic Research Summary

Gene	Diplotype	Activity †
ABCB1(rs1128503)	G|G	Positive
ABCG2	G|G	Normal function
ADRA2A(c.-1252G>C)	G|C	Positive
ANKK1	G|A	Altered function
ApoE	ε3|ε4	See ApoE Research Summary
ATM(C11orf65)	C|C	Negative
BCHE	WT|WT	Normal function
BDNF	C|C	Normal function
CACNA1C(270344G>A)	G|G	Negative
CACNA1C(5361G>A)	G|A	Positive
COMT(Val158Met)	G|A	Decreased function
CYP1A2	*1A|*1F	Normal metabolizer
CYP2B6	*9/*9	Poor metabolizer
CYP2C	G|G	Negative
CYP2C19	*1|*17	Rapid metabolizer
CYP2C8	*1|*2	Intermediate metabolizer
CYP2C9	*1|*1	Normal metabolizer
CYP2D6	*1|*5	Intermediate metabolizer
CYP3A4	*1|*1	Normal metabolizer
CYP3A5	*1|*3	Intermediate metabolizer
CYP4F2	*1|*1	Normal metabolizer
DBH(-1021C>T)	C|C	Positive
DPYD	Reference/ c.1627A>G (*5)	Normal metabolizer
DRD2(-241A>G)	T/T	Negative
Prothrombin (F2)	G/G	Negative

Gene	Diplotype	Activity †
Factor V Leiden (F5)	C|C	Negative
FKBP5(rs1360780)	T|T	Negative
FKBP5(rs4713916)	G|G	Positive
G6PD	B (reference)|B (reference)	Normal function
GRIK1(rs2832407)	A|A	Positive
GRIK4	T|C	Positive
GRIN2B(rs2058878)	T|T	Negative
HLA-A*3101	WT|WT	Negative
HLA-B*1502	WT|*1502	Positive
HLA-B*5701	WT|WT	Negative
HLA-B*5801	WT|*5801	Positive
HTR2A(rs7997012)	rs7997012 G/G	Positive
HTR2C(2565G>C)	G/G	Positive
HTR2C(-759C>T)	C|C	Negative
IFNL3	T|T	Positive
MTHFR (A1298C)	T|T	See Thrombosis Research Summary
MTHFR (C677T)	G|G	See Thrombosis Research Summary
NUDT15	*1|*1	Normal metabolizer
OPRD1(rs678849)	C|T	Positive
OPRK1(rs6473797)	T|C	Positive
OPRM1(A118G)	A|A	Normal function
SLCO1B1	*1|*1	Normal function
TPMT	*1|*1	Normal metabolizer
UGT2B15	*1|*2	Decreased function
VKORC1	*1|*2	Medium sensitivity to warfarin

Thrombosis Research Summary

Tested Gene (Allele)	Diplotype Classification	Research Summary
Prothrombin (F2)	Normal	Normal risk expected based on the patient's genotype. The absence of these variant alleles of Prothrombin (Factor II) and Factor V Leiden suggests that the patient does not have the elevated risk of thrombosis associated with these genetic markers.
Factor V Leiden	Normal	
MTHFR (A1298C)	Normal	
MTHFR (C677T)	Normal	

References

- Zhang S, et al.; ACMG Laboratory Quality Assurance Committee. Venous thromboembolism laboratory testing (factor V Leiden and factor II c.*97G>A), 2018 update: a technical standard of the American College of Medical Genetics and Genomics (ACMG). Genet Med. 2018 Dec;20(12):1489-1498. doi: 10.1038/s41436-018-0322-z. Epub 2018 Oct 5. PMID: 30297698.
- Bhatt S, et al.; ACMG Professional Practice and Guidelines Committee. Addendum: American College of Medical Genetics consensus statement on factor V Leiden mutation testing. Genet Med. 2021 Mar 5. doi: 10.1038/s41436-021-01108-x. Epub ahead of print. PMID: 33674767.
- Lim MY, et al.; Thrombophilic risk of individuals with rare compound factor V Leiden and prothrombin G20210A polymorphisms: an international case series of 100 individuals. Eur J Haematol. 2016 Oct;97(4):353-60. doi: 10.1111/ejh.12738. Epub 2016 Feb 18. PMID: 26773706.
- Saemundsson Y, et al.; Homozygous factor V Leiden and double heterozygosity for factor V Leiden and prothrombin mutation. J Thromb Thrombolysis. 2013 Oct;36(3):324-31. doi: 10.1007/s11239-012-0824-5. PMID: 23054468.
- Stevens SM, et al.; Guidance for the evaluation and treatment of hereditary and acquired thrombophilia. J Thromb Thrombolysis. 2016 Jan;41(1):154-64. doi: 10.1007/s11239-015-1316-1. PMID: 26780744; PMCID: PMC4715840.

ApoE Research Summary

Tested Gene (Alleles)	Diplotype	Research Summary
ApoE (ε2, ε3, ε4)	ε3|ε4	One wild type allele and one variant allele. There is a potential increased risk of cardiovascular disease and atherosclerosis.

Medication Research Summary

Addiction			
Therapeutic Class	**Standard Precautions**	**Caution / Info**	**Change Indicated**
Alpha-2-adrenergic agonists		Lofexidine	
Analgesics, Opioid	Buprenorphine	Methadone (CYP2B6)	

Anesthesiology			
Therapeutic Class	**Standard Precautions**	**Caution / Info**	**Change Indicated**
Amide Local Anesthetics	Bupivacaine Mepivacaine Ropivacaine		
Bisbenzyltetrahydroisoquinolinium Agents	Mivacurium		
Ester Local Anesthetics	Chloroprocaine		
Neuromuscular Depolarizing Agents	Succinylcholine		

Cardiology			
Therapeutic Class	**Standard Precautions**	**Caution / Info**	**Change Indicated**
Anti-angina medication		Ranolazine	
Antiarrhythmics		Flecainide Propafenone	
Anticoagulants	Acenocoumarol Warfarin (CYP2C9, CYP4F2, VKORC1) Warfarin (rs12777823)		
Antiplatelet Agents	Clopidogrel		

Cardiology

Therapeutic Class	Standard Precautions	Caution / Info	Change Indicated
	Prasugrel Ticagrelor		
Beta Blockers	Nebivolol Propranolol	Carvedilol Metoprolol Timolol	
Cardiac Myosin Inhibitors		Mavacamten	
Protease-Activated Receptor-1 Antagonists	Vorapaxar		
Statins	Atorvastatin Atorvastatin (SLCO1B1) Fluvastatin (SLCO1B1, CYP2C9) Lovastatin (SLCO1B1) Pitavastatin (SLCO1B1) Pravastatin (SLCO1B1) Rosuvastatin (SLCO1B1, ABCG2) Simvastatin		
Thrombopoietin Receptor Agonists	Eltrombopag		
Vasodilator	Nicorandil Nitroglycerin		

Dermatology

Therapeutic Class	Standard Precautions	Caution / Info	Change Indicated
Kinase inhibitors	Deuruxolitinib	Abrocitinib	

Dyskinesia

Therapeutic Class	Standard Precautions	Caution / Info	Change Indicated
Vesicular monoamine transporter 2 inhibitor		Deutetrabenazine Valbenazine	

Endocrinology

Therapeutic Class	Standard Precautions	Caution / Info	Change Indicated
Biguanides		Metformin	
Dipeptidyl peptidase-4 (DPP-4) inhibitor	Saxagliptin		
Meglitinides	Nateglinide		
Nonsteroidal Antiandrogen	Flutamide		
Sulfonylurea	Chlorpropamide Gliclazide (CYP2C9) Glimepiride (CYP2C9) Glipizide Glyburide (CYP2C9) Glyburide (G6PD) Tolazamide Tolbutamide (CYP2C9)		

Gastroenterology

Therapeutic Class	Standard Precautions	Caution / Info	Change Indicated
Antiemetics		Meclizine Ondansetron Tropisetron	
Cannabinoids	Dronabinol		
Prokinetic agents		Metoclopramide	

Gastroenterology			
Therapeutic Class	**Standard Precautions**	**Caution / Info**	**Change Indicated**
Proton Pump Inhibitors (PPIs)		Dexlansoprazole Esomeprazole Lansoprazole Omeprazole Pantoprazole Rabeprazole	
Vitamins	Vitamin C		

Gaucher's disease			
Therapeutic Class	**Standard Precautions**	**Caution / Info**	**Change Indicated**
Enzyme Inhibitors		Eliglustat	

Gout			
Therapeutic Class	**Standard Precautions**	**Caution / Info**	**Change Indicated**
Enzymes	Pegloticase Rasburicase		
Urate Transporter Inhibitors	Lesinurad		
Xanthine Oxidase Inhibitor	Allopurinol (ABCG2)		Allopurinol (HLA-B*5801)

Gynecology			
Therapeutic Class	**Standard Precautions**	**Caution / Info**	**Change Indicated**
5-HT Receptor Modulators	Flibanserin		
Selective Estrogen	Ospemifene		

Gynecology			
Therapeutic Class	**Standard Precautions**	**Caution / Info**	**Change Indicated**
Receptor Modulators	(CYP3A4,CYP2C9)		

Hematology			
Therapeutic Class	**Standard Precautions**	**Caution / Info**	**Change Indicated**
Phenothiazines	Methylene blue		
Thrombopoietin Receptor Agonists	Avatrombopag (CYP2C9) Avatrombopag (F2, F5) Lusutrombopag (F2, F5)		

Immunology			
Therapeutic Class	**Standard Precautions**	**Caution / Info**	**Change Indicated**
Cholinergic Agonists		Cevimeline	
Disease-modifying anti-rheumatic drug (DMARD)	Sulfasalazine		
Immunosuppressants	Azathioprine (TPMT, NUDT15) Cyclosporine Sirolimus	Tacrolimus (CYP3A5)	
Kinase inhibitors	Deuruxolitinib		
Nonsteroidal Anti-Inflammatory Drugs (NSAIDs)	Tenoxicam		
Purine analogs	Mercaptopurine (TPMT, NUDT15)		

Infectious Disease

Therapeutic Class	Standard Precautions	Caution / Info	Change Indicated
Alkaloids	Chloroquine Hydroxychloroquine Quinine		
Antibiotics	Dapsone Flucloxacillin Moxifloxacin Nalidixic acid Ofloxacin Sulfadiazine		
Antifungals	Flucytosine Ketoconazole		Voriconazole
Antimalarials	Primaquine Tafenoquine		
Interferons		Peginterferon alfa-2a Peginterferon alfa-2b	
Non-nucleoside reverse transcriptase inhibitors		Efavirenz Nevirapine	
Nucleoside reverse transcriptase inhibitors	Abacavir		

Neurology

Therapeutic Class	Standard Precautions	Caution / Info	Change Indicated
Anticonvulsants		Brivaracetam Clobazam	Carbamazepine (HLA-B*1502, HLA-A*3101) Fosphenytoin (HLA-B*1502, CYP2C9) Lamotrigine Oxcarbazepine Phenytoin (HLA-B*1502, CYP2C9)

Neurology

Therapeutic Class	Standard Precautions	Caution / Info	Change Indicated
Benzodiazepines	Alprazolam Clonazepam	Diazepam Lorazepam Oxazepam	
Central Monoamine-Depleting Agents		Tetrabenazine	
Central Nervous System Agents		Dextromethorphan-Quinidine	
Cholinesterase Inhibitors	Galantamine	Donepezil	
Smoking Cessation	Bupropion (CYP2B6)	Bupropion (ANKK1)	
Sphingosine-1-phosphate receptor modulators	Siponimod		

Oncology

Therapeutic Class	Standard Precautions	Caution / Info	Change Indicated
Antiestrogens			Tamoxifen
Antimetabolites	Capecitabine Fluorouracil Methotrexate Tegafur		
EGFR Inhibitors		Gefitinib	
Fibroblast growth factor receptor inhibitors	Erdafitinib		
Kinase inhibitors	Dabrafenib		
Kinase Inhibitors	Pazopanib (HLA-B*5701)		

Oncology

Therapeutic Class	Standard Precautions	Caution / Info	Change Indicated
Nonsteroidal Antiandrogen	Flutamide		
Platinum-containing compounds	Cisplatin		
Purine analogs	Mercaptopurine (TPMT, NUDT15)		
Purine antagonists	Thioguanine (TPMT, NUDT15)		
Xanthine Oxidase Inhibitor	Allopurinol (ABCG2)		Allopurinol (HLA-B*5801)

Pain

Therapeutic Class	Standard Precautions	Caution / Info	Change Indicated
Analgesics, Opioid	Alfentanil Buprenorphine Fentanyl (CYP3A4) Fentanyl (OPRM1) Hydromorphone Morphine Oxycodone (CYP2D6) Oxycodone (CYP3A4) Sufentanil (CYP3A4) Sufentanil (OPRM1)	Codeine Dihydrocodeine Hydrocodone Methadone (CYP2B6) Oliceridine Oxycodone (CYP3A5) Tramadol	
Atypical antipsychotics	Olanzapine		
Muscle Relaxants		Carisoprodol	
Nonsteroidal Anti-Inflammatory Drugs (NSAIDs)	Carbasalate calcium Celecoxib Diclofenac Flurbiprofen		

Pain

Therapeutic Class	Standard Precautions	Caution / Info	Change Indicated
	Ibuprofen Lornoxicam Meloxicam Piroxicam Tenoxicam		
Selective Serotonin Reuptake Inhibitors (SSRIs)		Vortioxetine	
Serotonin and Norepinephrine Reuptake Inhibitors (SSNRI)		Duloxetine	Venlafaxine
Serotonin Receptor Antagonists and Reuptake Inhibitors (SARIs)	Trazodone		
Skeletal muscle relaxant		Tolperisone	
Tetracyclic antidepressants	Mirtazapine		
Tricyclic antidepressants		Amoxapine Desipramine Nortriptyline Protriptyline	Amitriptyline (CYP2C19, CYP2D6) Clomipramine (CYP2C19, CYP2D6) Doxepin (CYP2C19, CYP2D6) Imipramine (CYP2C19, CYP2D6) Trimipramine (CYP2C19, CYP2D6)

Psychiatry

Therapeutic Class	Standard Precautions	Caution / Info	Change Indicated
Alpha-2-adrenergic agonists	Guanfacine	Clonidine	
Anxiolytics	Buspirone		
Atypical antipsychotics	Brexpiprazole Olanzapine Quetiapine	Aripiprazole Aripiprazole Lauroxil Clozapine Iloperidone Risperidone Sertindole	
CNS Stimulants		Amphetamine (COMT) Amphetamine (CYP2D6) Dexmethylphenidate Dextroamphetamine Lisdexamfetamine Methylphenidate (ADRA2A) Methylphenidate (COMT)	
H3 receptor antagonist		Pitolisant	
Hypnotics	Eszopiclone		
Monoamine Oxidase Inhibitors		Moclobemide	
Selective Norepinephrine Reuptake Inhibitors (SNRI)	Viloxazine	Atomoxetine	
Selective Serotonin Reuptake Inhibitors (SSRIs)	Fluoxetine Sertraline (CYP2C19, CYP2B6)	Citalopram Escitalopram Fluvoxamine Paroxetine Vortioxetine	

Psychiatry

Therapeutic Class	Standard Precautions	Caution / Info	Change Indicated
Serotonin and Norepinephrine Reuptake Inhibitors (SSNRI)		Duloxetine	Venlafaxine
Serotonin Receptor Antagonists and Reuptake Inhibitors (SARIs)	Trazodone		
Tetracyclic antidepressants	Mirtazapine		
Tricyclic antidepressants		Amoxapine Desipramine Nortriptyline Protriptyline	Amitriptyline (CYP2C19, CYP2D6) Clomipramine (CYP2C19, CYP2D6) Doxepin (CYP2C19, CYP2D6) Imipramine (CYP2C19, CYP2D6) Trimipramine (CYP2C19, CYP2D6)
Typical antipsychotics	Flupenthixol Haloperidol	Perphenazine Pimozide Zuclopenthixol	Thioridazine

Reproductive

Therapeutic Class	Standard Precautions	Caution / Info	Change Indicated
Contraceptives	Estrogen-containing oral contraceptives		

Rheumatology			
Therapeutic Class	**Standard Precautions**	**Caution / Info**	**Change Indicated**
Disease-modifying anti-rheumatic drug (DMARD)	Sulfasalazine		

Toxicology			
Therapeutic Class	**Standard Precautions**	**Caution / Info**	**Change Indicated**
Antidote	Sodium nitrite		
Phenothiazines	Methylene blue		

Urology			
Therapeutic Class	**Standard Precautions**	**Caution / Info**	**Change Indicated**
Adrenergic alpha-1 Receptor Antagonists		Tamsulosin	
Anticholinergic Agents		Fesoterodine Tolterodine	
Antimuscarinics	Darifenacin		
Beta-3 Adrenergic Agonists	Mirabegron		
Selective Serotonin Reuptake Inhibitors (SSRIs)		Dapoxetine	

Other Drugs			
Therapeutic Class	**Standard Precautions**	**Caution / Info**	**Change Indicated**

Legend

Research Summary

- Typical response is expected
- Consider alternative therapy
- Change Indicated
- Additional information available
- Response is uncertain

Evidence Level

- Strong
- Moderate
- Emerging

Medication Research Details (by therapeutic class)

Drug	Finding	Research Summary	Concern	Evidence
5-HT Receptor Modulators				
Flibanserin (Addyi)	CYP2C19: Rapid metabolizer. One normal function allele and one increased function allele.	Rapid metabolizers of this medication may present slightly lower plasma concentrations of the active medication. No additional therapeutic recommendations.		Moderate
Adrenergic alpha-1 Receptor Antagonists				
Tamsulosin (Flomax)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Be alert to adverse reactions; monitor the patient's response to guide dosing.	ADR	Moderate
Alkaloids				
Chloroquine (Aralen)	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		Strong
Hydroxychloroquine (Plaquenil)	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		Strong
Quinine (Qualaquin, Quinbisul)	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		Strong

Drug	Finding	Research Summary	Concern	Evidence
Alpha-2-adrenergic agonists				
Clonidine (Clonidine, Kapvay)	ADRA2A(c.-1252G>C): One wild type allele and one variant allele.	Individuals with these heterozygous alleles may present with increased risk of pharmacotherapy failure. Be alert to lack of efficacy.	Efficacy	
Guanfacine (Tenex, Intuniv)	CYP3A4: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Lofexidine (Kai Er Ding, Lucemyra, Britlofex)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Be alert to adverse reactions; monitor the patient's response to guide dosing.	ADR	
Amide Local Anesthetics				
Bupivacaine (Marcaine, Sensorcaine, Posimir)	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Mepivacaine (Carbocaine, Polocaine)	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Ropivacaine (Naropin)	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		

Drug	Finding	Research Summary	Concern	Evidence
Analgesics, Opioid				
Alfentanil (Rapifen, Alfenta)	OPRM1(A118G): Normal function. Two normal function alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Buprenorphine (Butrans, Buprenex)	CYP3A4: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Codeine	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with notably lower plasma concentrations of the active medication, thus an increased risk of pharmacotherapy failure. Be alert to lack of efficacy.	Efficacy	
Dihydrocodeine	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with notably lower plasma concentrations of the active medication, thus an increased risk of pharmacotherapy failure. Be alert to lack of efficacy.	Efficacy	
Fentanyl (CYP3A4) (Duragesic, Sublimaze)	CYP3A4: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Fentanyl (OPRM1) (Duragesic, Sublimaze)	OPRM1(A118G): Normal function. Two normal function alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Hydrocodone	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with lower plasma concentrations of the active medication, thus an increased risk of pharmacotherapy failure. Be alert to lack of efficacy; monitor the patient's response to guide dosing.	Efficacy	
Hydromorphone (Dilaudid)	OPRM1(A118G): Normal function. Two normal function alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		

Drug	Finding	Research Summary	Concern	Evidence
Methadone (CYP2B6) (Dolophine, Methadose)	CYP2B6: Poor metabolizer. Two decreased function alleles.	Poor metabolizers of this medication may present with notably higher plasma concentrations of the active medication, thus an increased risk of side effects. Be alert to adverse reactions; monitor the patient's response to guide dosing.	ADR	
Morphine (MS-IR)	OPRM1(A118G): Normal function. Two normal function alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Oliceridine (Olinvyk)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Consider reducing the dose.	ADR	
Oxycodone (CYP2D6) (Oxycontin)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Typical response expected. No additional therapeutic recommendations.		
Oxycodone (CYP3A4) (Oxycontin)	CYP3A4: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Oxycodone (CYP3A5) (Oxycontin)	CYP3A5: Intermediate metabolizer. One normal function allele and one little or no function allele.	Intermediate metabolizers of this medication may present with lower plasma concentrations of the active medication, thus an increased risk of pharmacotherapy failure. Be alert to lack of efficacy; monitor the patient's response to guide dosing.	Efficacy	
Sufentanil (CYP3A4) (Dsuvia, Sufenta, Zalviso)	CYP3A4: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Sufentanil (OPRM1) (Sufenta)	OPRM1(A118G): Normal function. Two normal function alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		

Drug	Finding	Research Summary	Concern	Evidence
Tramadol (Ultracet, Ultram)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication frequently present with lower plasma concentrations of the active medication, thus a significantly increased risk of pharmacotherapy failure. Be alert to lack of efficacy; monitor the patient's response to guide dosing.	Efficacy	
Anti-angina medication				
Ranolazine (Ranexa)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Consider reducing the dose.	ADR	
Antiarrhythmics				
Flecainide (Tambocor)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication frequently present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Consider reducing the dose, or using an alternative medication.	ADR	
Propafenone (Rythmol)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication frequently present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Consider reducing the dose; monitor the patient's response to guide dosing.	ADR	

Drug	Finding	Research Summary	Concern	Evidence
Antibiotics				
Dapsone (Aczone)	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Flucloxacillin (Floxapen)	HLA-B*5701: Negative; Absence of *57:01 alleles.	Individuals with wild type alleles are expected to show typical response. No additional therapeutic recommendations.		
Moxifloxacin (Avelox, Vigamox, Moxiflox)	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Nalidixic acid (Nevigramon, Neggram, Wintomylon, WIN 18320)	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Ofloxacin (Floxin, Ocuflox)	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Sulfadiazine (SILVADENE)	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Anticholinergic Agents				
Fesoterodine (Toviaz)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication. Be alert to adverse reactions; monitor the patient's response to guide dosing.	ADR	
Tolterodine (Detrol)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Be alert to adverse reactions; monitor the patient's response to guide dosing.	ADR	

Drug	Finding	Research Summary	Concern	Evidence
Anticoagulants				
Acenocoumarol (Sintrom, Acitrom)	CYP2C9: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Warfarin (CYP2C9, CYP4F2, VKORC1) (Coumadin)	Multigenic: CYP2C9, VKORC1, CYP4F2: Normal metabolizer. Two normal function alleles.; Normal function. Two alleles with normal activity.	Individuals with this combination of alleles may benefit from a standard therapeutic dose of warfarin. Consider a regimen of 4.1-5.9 mg/day (29-41 mg/week).	ADR & Efficacy	
Warfarin (rs12777823) (Coumadin)	CYP2C: Two wild-type alleles.	Individuals with wild type alleles are expected to show typical response. No additional therapeutic recommendations.		

Drug	Finding	Research Summary	Concern	Evidence
Anticonvulsants				
Brivaracetam (Briviact, Nubriveo, Brivajoy)	CYP2C19: Rapid metabolizer. One normal function allele and one increased function allele.	Rapid metabolizers of this medication may present with lower plasma concentrations of the active medication, thus an increased risk of pharmacotherapy failure. Be alert to lack of efficacy; monitor the patient's response to guide dosing.	Efficacy	
Carbamazepine (HLA-B*1502, HLA-A*3101) (Tegretol)	Multigenic: HLA-B*1502, HLA-A*3101: Positive; One *15:02 variant allele detected.; Negative; Absence of *31:01 alleles.	Individuals with this combination of alleles frequently present with significantly increased risk of side effects. This medication should be avoided.	ADR	
Clobazam (Onfi)	CYP2C19: Rapid metabolizer. One normal function allele and one increased function allele.	Rapid metabolizers of this medication may present with lower plasma concentrations of the active medication, thus a significantly increased risk of pharmacotherapy failure. Be alert to lack of efficacy; monitor the patient's response to guide dosing.	Efficacy	
Fosphenytoin (HLA-B*1502, CYP2C9) (Cerebyx)	Multigenic: CYP2C9, HLA-B*1502: Normal metabolizer. Two normal function alleles.; Positive; One *15:02 variant allele detected.	Individuals with this combination of alleles frequently present with significantly increased risk of side effects. This medication should be avoided.	ADR	
Lamotrigine (Lamictal)	HLA-B*1502: Positive; One *15:02 variant allele detected.	Individuals with these heterozygous alleles frequently present with significantly increased risk of side effects. This medication should be avoided.	ADR	
Oxcarbazepine (Trileptal)	HLA-B*1502: Positive; One *15:02 variant allele detected.	Individuals with these heterozygous alleles frequently present with significantly increased risk of side effects. This medication should be avoided.	ADR	
Phenytoin (HLA-B*1502, CYP2C9) (Dilantin)	Multigenic: CYP2C9, HLA-B*1502: Normal metabolizer. Two normal function alleles.; Positive; One *15:02 variant allele detected.	Individuals with this combination of alleles frequently present with significantly increased risk of side effects. This medication should be avoided.	ADR	

Drug	Finding	Research Summary	Concern	Evidence
Antidote				
Sodium nitrite (Nithiodote)	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Antiemetics				
Meclizine (Bonine, Antivert)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Be alert to adverse reactions; monitor the patient's response to guide dosing.	ADR	
Ondansetron (Zofran)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication. Monitor the patient's response to guide dosing.	ADR	
Tropisetron (Navoban, Setrovel)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Be alert to adverse reactions; monitor the patient's response to guide dosing.	ADR	
Antiestrogens				
Tamoxifen (Soltamox, Nolvadex)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication frequently present with lower plasma concentrations of the active medication, thus a significantly increased risk of pharmacotherapy failure. This medication should be avoided.	Efficacy	

Drug	Finding	Research Summary	Concern	Evidence
Antifungals				
Flucytosine (Ancobon, Cytoflu, Ancotil)	DPYD: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Ketoconazole (Nizoral)	CYP3A4: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Voriconazole (Vfend)	CYP2C19: Rapid metabolizer. One normal function allele and one increased function allele.	Rapid metabolizers of this medication frequently present with lower plasma concentrations of the active medication, thus a significantly increased risk of pharmacotherapy failure. This medication should be avoided.	Efficacy	
Antimalarials				
Primaquine (Jasoprim, Malirid)	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Tafenoquine (Krintafel, Arakoda)	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		

Drug	Finding	Research Summary	Concern	Evidence
Antimetabolites				
Capecitabine (Xeloda, Xitabin, Kapetral)	DPYD: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Fluorouracil (Efudex, Adrucil, Carac, Efudix)	DPYD: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Methotrexate (Trexall, Rheumatrex, Otrexup)	Multigenic: MTHFR (C677T), MTHFR (A1298C): Normal function. Two normal function alleles.; Normal function. Two normal function alleles.	Individuals with this combination of alleles are expected to show typical response. No additional therapeutic recommendations.		
Tegafur (Teysuno)	DPYD: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Antimuscarinics				
Darifenacin (Enablex, Emselex)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication. No additional therapeutic recommendations.		

Drug		Finding	Research Summary	Concern	Evidence
Antiplatelet Agents					
Clopidogrel (Plavix)	✓	CYP2C19: Rapid metabolizer. One normal function allele and one increased function allele.	Rapid metabolizers of this medication frequently present with higher plasma concentrations of the active medication, frequently present with increased medication efficacy. No additional therapeutic recommendations.	Efficacy	●
Prasugrel (Effient)	✓	CYP2C19: Rapid metabolizer. One normal function allele and one increased function allele.	Typical response expected. No additional therapeutic recommendations.		●
Ticagrelor (Brilinta)	✓	CYP3A4: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		●
Anxiolytics					
Buspirone (Buspar)	✓	CYP3A4: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		●

Drug	Finding	Research Summary	Concern	Evidence
Atypical antipsychotics				
Aripiprazole (Abilify)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication frequently present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Consider reducing the dose; monitor the patient's response to guide dosing.	ADR	
Aripiprazole Lauroxil (Aristada Initio, Aristada)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication frequently present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Consider reducing the dose; monitor the patient's response to guide dosing.	ADR	
Brexpiprazole (Rexulti)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Clozapine (Clozaril, Leponex, Versacloz)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Be alert to adverse reactions; monitor the patient's response to guide dosing.	ADR	
Iloperidone (Fanapt)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Consider reducing the dose.	ADR	
Olanzapine (Zalasta, Zyprexa)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Typical response expected. No additional therapeutic recommendations.		
Quetiapine (Seroquel)	CYP3A4: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		

Drug	Finding	Research Summary	Concern	Evidence
Risperidone (Risperdal)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Consider reducing the dose; monitor the patient's response to guide dosing.	ADR	
Sertindole (Serdolect, Serlect)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Be alert to adverse reactions; monitor the patient's response to guide dosing.	ADR	
Benzodiazepines				
Alprazolam (Xanax, Niravam)	CYP3A4: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Clonazepam (Klonopin)	CYP3A4: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Diazepam (Valium)	CYP2C19: Rapid metabolizer. One normal function allele and one increased function allele.	Rapid metabolizers of this medication may present with lower plasma concentrations of the active medication, thus an increased risk of pharmacotherapy failure. Be alert to lack of efficacy; monitor the patient's response to guide dosing.	Efficacy	
Lorazepam (Ativan)	UGT2B15: Decreased function. One normal function allele and one decreased function allele.	Individuals with decreased function of this gene may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Be alert to adverse reactions; monitor the patient's response to guide dosing.	ADR	
Oxazepam (Alepam)	UGT2B15: Decreased function. One normal function allele and one decreased function allele.	Individuals with decreased function of this gene may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Be alert to adverse reactions; monitor the patient's response to guide dosing.	ADR	

Drug	Finding	Research Summary	Concern	Evidence
Beta-3 Adrenergic Agonists				
Mirabegron (Myrbetriq)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication. No additional therapeutic recommendations.		
Beta Blockers				
Carvedilol (Coreg)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Be alert to adverse reactions.	ADR	
Metoprolol (Lopressor)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication frequently present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Consider reducing the dose, or using an alternative medication.	ADR	
Nebivolol (Bystolic)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Typical response expected. No additional therapeutic recommendations.		
Propranolol (Inderal)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Typical response expected. No additional therapeutic recommendations.		
Timolol (Blocadren)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Be alert to adverse reactions; monitor the patient's response to guide dosing.	ADR	
Biguanides				
Metformin (Glucophage)	ATM(C11orf65): Two wild-type alleles.	Individuals with wild type alleles frequently present with increased medication efficacy. No additional therapeutic recommendations.	Efficacy	

Drug	Finding	Research Summary	Concern	Evidence
Bisbenzyltetrahydroisoquinolinium Agents				
Mivacurium (Mivacron)	BCHE: Normal function. Two normal function alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Cannabinoids				
Dronabinol (Marinol, Syndros, Reduvo, Adversa)	CYP2C9: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Cardiac Myosin Inhibitors				
Mavacamten (Camzyos)	CYP2C19: Rapid metabolizer. One normal function allele and one increased function allele.	Rapid metabolizers of this medication may present with lower plasma concentrations of the active medication, thus an increased risk of pharmacotherapy failure. Be alert to lack of efficacy; monitor the patient's response to guide dosing.	Efficacy	
Central Monoamine-Depleting Agents				
Tetrabenazine (Xenazine)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication frequently present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Consider reducing the dose.	ADR	
Central Nervous System Agents				
Dextromethorphan-Quinidine (Nuedexta)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Be alert to adverse reactions, or consider alternative medication.	ADR	

Drug	Finding	Research Summary	Concern	Evidence
Cholinergic Agonists				
Cevimeline (Evoxac)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Be alert to adverse reactions; monitor the patient's response to guide dosing.	ADR	
Cholinesterase Inhibitors				
Donepezil (Aricept)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Be alert to adverse reactions; monitor the patient's response to guide dosing.	ADR	
Galantamine (Razadyne, Razadyne ER, Nivalin, Lycoremine, Reminyl)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		

Drug	Finding	Research Summary	Concern	Evidence
CNS Stimulants				
Amphetamine (COMT) (Adzenys, Evekeo)	COMT(Val158Met): Decreased function. One normal function allele and one decreased function allele.	Individuals with decreased function of this gene may present with increased risk of pharmacotherapy failure. Be alert to lack of efficacy.	Efficacy	
Amphetamine (CYP2D6) (Adzenys, Evekeo)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Consider reducing the dose, or using an alternative medication.	ADR	
Dexmethylphenidate (Focalin)	COMT(Val158Met): Decreased function. One normal function allele and one decreased function allele.	Individuals with decreased function of this gene may present with increased risk of pharmacotherapy failure. Be alert to lack of efficacy.	Efficacy	
Dextroamphetamine (Zenzedi, Dexedrine)	COMT(Val158Met): Decreased function. One normal function allele and one decreased function allele.	Individuals with decreased function of this gene may present with increased risk of pharmacotherapy failure. Be alert to lack of efficacy.	Efficacy	
Lisdexamfetamine (Vyvanse)	COMT(Val158Met): Decreased function. One normal function allele and one decreased function allele.	Individuals with decreased function of this gene may present with increased risk of pharmacotherapy failure. Be alert to lack of efficacy.	Efficacy	
Methylphenidate (ADRA2A) (Concerta, Metadate, Ritalin, Ritalin LA, Quillivant, Daytrana, Methylin)	ADRA2A(c.-1252G>C): One wild type allele and one variant allele.	Individuals with these heterozygous alleles may present with increased risk of pharmacotherapy failure. Be alert to lack of efficacy.	Efficacy	
Methylphenidate (COMT) (Concerta, Metadate, Ritalin, Ritalin LA, Quillivant, Daytrana, Methylin)	COMT(Val158Met): Decreased function. One normal function allele and one decreased function allele.	Individuals with decreased function of this gene may present with increased risk of pharmacotherapy failure. Be alert to lack of efficacy.	Efficacy	

Drug	Finding	Research Summary	Concern	Evidence
Contraceptives				
Estrogen-containing oral contraceptives	F5: Two wild-type alleles.	Individuals with wild type alleles are expected to show typical response. No additional therapeutic recommendations.		
Dipeptidyl peptidase-4 (DPP-4) inhibitor				
Saxagliptin (Onglyza)	CYP3A4: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Disease-modifying anti-rheumatic drug (DMARD)				
Sulfasalazine (Azulfidine)	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
EGFR Inhibitors				
Gefitinib (Iressa)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Be alert to adverse reactions; monitor the patient's response to guide dosing.	ADR	
Enzyme Inhibitors				
Eliglustat (Cerdelga)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication frequently present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Consider reducing the dose, or using an alternative medication.	ADR	

Drug	Finding	Research Summary	Concern	Evidence
Enzymes				
Pegloticase (Krystexxa, Puricase)	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Rasburicase (Elitek, Fasturtec)	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Ester Local Anesthetics				
Chloroprocaine (Nesacaine)	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Fibroblast growth factor receptor inhibitors				
Erdafitinib (Balversa)	CYP2C9: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
H3 receptor antagonist				
Pitolisant (Wakix)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Consider reducing the dose.	ADR	
Hypnotics				
Eszopiclone (Lunesta)	CYP3A4: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		

Drug		Finding	Research Summary	Concern	Evidence
Immunosuppressants					
Azathioprine (TPMT, NUDT15) (Imuran)	✓	Multigenic: TPMT, NUDT15: Normal metabolizer. Two normal function alleles.; Normal metabolizer. Two normal function alleles.	Individuals with this combination of alleles are expected to show typical response. No additional therapeutic recommendations.		●
Cyclosporine (Gengraf, Neoral)	✓	CYP3A4: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		●
Sirolimus (Rapamune)	✓	CYP3A4: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		●
Tacrolimus (CYP3A4) (Prograf, Hecoria)	?	CYP3A4: Normal metabolizer. Two normal function alleles.	No recommendation for Tacrolimus (CYP3A4) is available for this combination of variants/alleles.		
Tacrolimus (CYP3A5) (Prograf, Hecoria)	!	CYP3A5: Intermediate metabolizer. One normal function allele and one little or no function allele.	Intermediate metabolizers of this medication frequently present with lower plasma concentrations of the active medication, thus an increased risk of pharmacotherapy failure. Consider increasing the dose; monitor the patient's response to guide dosing.	Efficacy	●
Interferons					
Peginterferon alfa-2a (Pegasys)	!	IFNL3: Two variant alleles detected.	Individuals with these homozygous variant alleles frequently present with increased risk of pharmacotherapy failure. Be alert to lack of efficacy; monitor the patient's response to guide dosing.	Efficacy	●
Peginterferon alfa-2b (PegIntron, Sylatron, ViraferonPeg)	!	IFNL3: Two variant alleles detected.	Individuals with these homozygous variant alleles frequently present with increased risk of pharmacotherapy failure. Be alert to lack of efficacy; monitor the patient's response to guide dosing.	Efficacy	●

Drug	Finding	Research Summary	Concern	Evidence
Kinase inhibitors				
Abrocitinib (Cibinqo)	CYP2C19: Rapid metabolizer. One normal function allele and one increased function allele.	Rapid metabolizers of this medication may present with lower plasma concentrations of the active medication, thus an increased risk of pharmacotherapy failure. Be alert to lack of efficacy; monitor the patient's response to guide dosing.	Efficacy	
Dabrafenib (Tafinlar)	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Deuruxolitinib (Leqselvi)	CYP2C9: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Kinase Inhibitors				
Pazopanib (HLA-B*5701) (Votrient)	HLA-B*5701: Negative; Absence of *57:01 alleles.	Individuals with wild type alleles are expected to show typical response. No additional therapeutic recommendations.		
Meglitinides				
Nateglinide (Starlix)	CYP2C9: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Monoamine Oxidase Inhibitors				
Moclobemide (Manerix, Aurorix, Amira, Clobemix, Depnil)	**CYP2C19: Rapid metabolizer. One normal function allele and one increased function allele.**	Rapid metabolizers of this medication may present with lower plasma concentrations of the active medication, thus an increased risk of pharmacotherapy failure. Be alert to lack of efficacy.	Efficacy	

Drug	Finding	Research Summary	Concern	Evidence
Muscle Relaxants				
Carisoprodol (Soma)	CYP2C19: Rapid metabolizer. One normal function allele and one increased function allele.	Rapid metabolizers of this medication may present with notably lower plasma concentrations of the active medication, thus an increased risk of pharmacotherapy failure. Be alert to lack of efficacy; consider alternative medication.	Efficacy	
Neuromuscular Depolarizing Agents				
Succinylcholine (suxamethonium, Anectine)	BCHE: Normal function. Two normal function alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		

Drug	Finding	Research Summary	Concern	Evidence
Non-drug				
ABCB1(rs1128503)	ABCB1(rs1128503): Two variant alleles detected.	No additional therapeutic recommendations.		
ABCG2	ABCG2: Normal function. Two normal function alleles.	Typical response is expected; no additional therapeutic recommendations.		
ADRA2A(c.-1252G>C)	ADRA2A(c.-1252G>C): One wild type allele and one variant allele.	No additional therapeutic recommendations.		
ANKK1	ANKK1: One wild type allele and one variant allele.	Altered function. Two alleles with altered activity.		
ApoE	ApoE: One wild type allele and one variant allele.	There is a potential increased risk of cardiovascular disease and atherosclerosis.		
BDNF	BDNF: Normal function. Two normal function alleles.	Typical response is expected; no additional therapeutic recommendations.		
CACNA1C(270344G>A)	CACNA1C(270344G>A): Two wild-type alleles.	Typical response is expected; no additional therapeutic recommendations.		
CACNA1C(5361G>A)	CACNA1C(5361G>A): One wild type allele and one variant allele.	No additional therapeutic recommendations.		
COMT(Val158Met)	COMT(Val158Met): Decreased function. One normal function allele and one decreased function allele.	No additional therapeutic recommendations.		
CYP1A2	CYP1A2: Normal metabolizer. Two normal function alleles.	Typical response is expected; no additional therapeutic recommendations.		
CYP2B6	CYP2B6: Poor metabolizer. Two decreased function alleles.	No additional therapeutic recommendations.		
CYP2C8	CYP2C8: Intermediate metabolizer. One normal function allele and one decreased function allele.	No additional therapeutic recommendations.		

Drug	Finding	Research Summary	Concern	Evidence
CYP4F2	CYP4F2: Normal function. Two alleles with normal activity.	Typical response is expected; no additional therapeutic recommendations.		
DBH(-1021C>T)	DBH(-1021C>T): Two variant alleles detected.	No additional therapeutic recommendations.		
DPYD	DPYD: Normal metabolizer. Two normal function alleles.	Typical response is expected; no additional therapeutic recommendations.		
DRD2(-241A>G)	DRD2(-241A>G): Two wild-type alleles.	Typical response is expected; no additional therapeutic recommendations.		
F2	F2: Two wild-type alleles.	Typical response is expected; no additional therapeutic recommendations.		
FKBP5(rs1360780)	FKBP5(rs1360780): Two wild-type alleles.	Typical response is expected; no additional therapeutic recommendations.		
FKBP5(rs4713916)	FKBP5(rs4713916): Two variant alleles detected.	No additional therapeutic recommendations.		
G6PD	G6PD: Normal function. Two non-deficient (class IV) alleles.	Typical response is expected; no additional therapeutic recommendations.		
GRIK1(rs2832407)	GRIK1(rs2832407): Two variant alleles detected.	No additional therapeutic recommendations.		
GRIK4	GRIK4: One wild type allele and one variant allele.	No additional therapeutic recommendations.		
GRIN2B(rs2058878)	GRIN2B(rs2058878): Two wild-type alleles.	Typical response is expected; no additional therapeutic recommendations.		
HTR2A	HTR2A(rs7997012): Two variant alleles detected.	No additional therapeutic recommendations.		
HTR2A(rs7997012)	HTR2A(rs7997012): Two variant alleles detected.	No additional therapeutic recommendations.		
HTR2C(-759C>T)	HTR2C(-759C>T): Two wild-type alleles.	Typical response is expected; no additional therapeutic recommendations.		
HTR2C(2565G>C)	HTR2C(2565G>C): Two variant alleles detected.	No additional therapeutic recommendations.		

Drug	Finding	Research Summary	Concern	Evidence
IFNL3	IFNL3: Two variant alleles detected.	No additional therapeutic recommendations.		
NUDT15	NUDT15: Normal metabolizer. Two normal function alleles.	Typical response is expected; no additional therapeutic recommendations.		
OPRD1(rs678849)	OPRD1(rs678849): One wild type allele and one variant allele.	No additional therapeutic recommendations.		
OPRK1(rs6473797)	OPRK1(rs6473797): One wild type allele and one variant allele.	No additional therapeutic recommendations.		
OPRM1(A118G)	OPRM1(A118G): Normal function. Two normal function alleles.	Normal function. Two alleles with normal activity.		
Opioid risk	Multigenic COMT DBH DRD2/ANKK1 MTHFR OPRM1	Elevated risk of Opioid Use Disorder (OUD).		
UGT2B15	UGT2B15: Decreased function. One normal function allele and one decreased function allele.	No additional therapeutic recommendations.		
Non-nucleoside reverse transcriptase inhibitors				
Efavirenz (Sustiva)	CYP2B6: Poor metabolizer. Two decreased function alleles.	Poor metabolizers of this medication frequently present with notably higher plasma concentrations of the active medication, thus an increased risk of side effects. Consider reducing the dose, or using an alternative medication.	ADR	
Nevirapine (Viramune)	CYP2B6: Poor metabolizer. Two decreased function alleles.	Poor metabolizers of this medication may present with notably higher plasma concentrations of the active medication, thus an increased risk of side effects. Be alert to adverse reactions; monitor the patient's response to guide dosing.	ADR	

Drug	Finding	Research Summary	Concern	Evidence
Nonsteroidal Antiandrogen				
Flutamide (Eulexin)	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		

Drug	Finding	Research Summary	Concern	Evidence
Nonsteroidal Anti-Inflammatory Drugs (NSAIDs)				
Carbasalate calcium (Ascal, Demigran)	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Celecoxib (Celebrex)	CYP2C9: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Diclofenac (Cataflam)	CYP2C9: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Flurbiprofen (Ocufen)	CYP2C9: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Ibuprofen (Motrin, Advil)	CYP2C9: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Lornoxicam (Xefo)	CYP2C9: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Meloxicam (Mobic)	CYP2C9: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Piroxicam (Feldene)	CYP2C9: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Tenoxicam (Mobiflex)	CYP2C9: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		

Drug		Finding	Research Summary	Concern	Evidence
Nucleoside reverse transcriptase inhibitors					
Abacavir (Ziagen)	✓	HLA-B*5701: Negative; Absence of *57:01 alleles.	Individuals with wild type alleles are expected to show typical response. No additional therapeutic recommendations.		●
Phenothiazines					
Methylene blue (Urelene blue, Provayblue, Proveblue)	✓	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		●
Platinum-containing compounds					
Cisplatin (Platinol)	✓	TPMT: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		●
Prokinetic agents					
Metoclopramide (Primperan, Reglan)	⚠	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Consider reducing the dose.	ADR	●
Protease-Activated Receptor-1 Antagonists					
Vorapaxar (Zontivity)	✓	CYP3A4: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		●

Drug	Finding	Research Summary	Concern	Evidence
Proton Pump Inhibitors (PPIs)				
Dexlansoprazole (Dexilant, Kapidex)	CYP2C19: Rapid metabolizer. One normal function allele and one increased function allele.	Rapid metabolizers of this medication may present with lower plasma concentrations of the active medication, thus an increased risk of pharmacotherapy failure. Consider increasing the dose.	Efficacy	
Esomeprazole (Nexium)	CYP2C19: Rapid metabolizer. One normal function allele and one increased function allele.	Rapid metabolizers of this medication may present with lower plasma concentrations of the active medication, thus an increased risk of pharmacotherapy failure. Consider increasing the dose.	Efficacy	
Lansoprazole (Prevacid)	CYP2C19: Rapid metabolizer. One normal function allele and one increased function allele.	Rapid metabolizers of this medication may present with lower plasma concentrations of the active medication, thus an increased risk of pharmacotherapy failure. Consider increasing the dose.	Efficacy	
Omeprazole (Prilosec, Zegerid)	CYP2C19: Rapid metabolizer. One normal function allele and one increased function allele.	Rapid metabolizers of this medication may present with lower plasma concentrations of the active medication, thus an increased risk of pharmacotherapy failure. Consider increasing the dose.	Efficacy	
Pantoprazole (Protonix)	CYP2C19: Rapid metabolizer. One normal function allele and one increased function allele.	Rapid metabolizers of this medication may present with lower plasma concentrations of the active medication, thus an increased risk of pharmacotherapy failure. Consider increasing the dose.	Efficacy	
Rabeprazole (Aciphex)	CYP2C19: Rapid metabolizer. One normal function allele and one increased function allele.	Rapid metabolizers of this medication may present with lower plasma concentrations of the active medication, thus an increased risk of pharmacotherapy failure. Consider increasing the dose.	Efficacy	

Drug	Finding	Research Summary	Concern	Evidence
Purine analogs				
Mercaptopurine (TPMT, NUDT15) (Purinethol)	Multigenic: TPMT, NUDT15: Normal metabolizer. Two normal function alleles.; Normal metabolizer. Two normal function alleles.	Individuals with this combination of alleles are expected to show typical response. No additional therapeutic recommendations.		
Purine antagonists				
Thioguanine (TPMT, NUDT15) (6-TG, Tabloid, Lanvis)	Multigenic: TPMT, NUDT15: Normal metabolizer. Two normal function alleles.; Normal metabolizer. Two normal function alleles.	Individuals with this combination of alleles are expected to show typical response. No additional therapeutic recommendations.		
Selective Estrogen Receptor Modulators				
Ospemifene (CYP3A4,CYP2C9) (Osphena, Senshio)	Multigenic: CYP3A4, CYP2C9: Normal metabolizer. Two normal function alleles.; Normal metabolizer. Two normal function alleles.	Individuals with this combination of alleles are expected to show typical response. No additional therapeutic recommendations.		
Selective Norepinephrine Reuptake Inhibitors (SNRI)				
Atomoxetine (Strattera)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Consider reducing the dose; monitor the patient's response to guide dosing.	ADR	
Viloxazine (Qelbree)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication. No additional therapeutic recommendations.		

Drug	Finding	Research Summary	Concern	Evidence
Selective Serotonin Reuptake Inhibitors (SSRIs)				
Citalopram (Celexa)	CYP2C19: Rapid metabolizer. One normal function allele and one increased function allele.	Rapid metabolizers of this medication frequently present with lower plasma concentrations of the active medication, thus an increased risk of pharmacotherapy failure. Consider increasing the dose, or using an alternative medication.	Efficacy	
Dapoxetine (Priligy, EJ-30)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Be alert to adverse reactions; monitor the patient's response to guide dosing.	ADR	
Escitalopram (Lexapro)	CYP2C19: Rapid metabolizer. One normal function allele and one increased function allele.	Rapid metabolizers of this medication frequently present with lower plasma concentrations of the active medication, thus an increased risk of pharmacotherapy failure. Consider increasing the dose, or using an alternative medication.	Efficacy	
Fluoxetine (Prozac)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Typical response expected. No additional therapeutic recommendations.		
Fluvoxamine (Luvox)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication. Be alert to adverse reactions; monitor the patient's response to guide dosing.	ADR	
Paroxetine (Paxil)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Consider reducing the dose; monitor the patient's response to guide dosing.	ADR	

Drug	Finding	Research Summary	Concern	Evidence
Sertraline (CYP2C19, CYP2B6) (Zoloft)	Multigenic: CYP2C19, CYP2B6: Rapid metabolizer. One normal function allele and one increased function allele.; Poor metabolizer. Two decreased function alleles.	Individuals with this combination of alleles are expected to show typical response. No additional therapeutic recommendations.		
Vortioxetine (Trintellix)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Monitor the patient's response to guide dosing.	ADR	
Serotonin and Norepinephrine Reuptake Inhibitors (SSNRI)				
Duloxetine (Cymbalta)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Be alert to adverse reactions; monitor the patient's response to guide dosing.	ADR	
Venlafaxine (Effexor)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication frequently present with lower plasma concentrations of the active medication/medication ratio, thus an increased risk of side effects and/or pharmacotherapy failure. This medication should be avoided.	ADR & Efficacy	
Serotonin Receptor Antagonists and Reuptake Inhibitors (SARIs)				
Trazodone (Oleptro, Desyrel)	CYP3A4: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Skeletal muscle relaxant				
Tolperisone (Mydocalm)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Be alert to adverse reactions; monitor the patient's response to guide dosing.	ADR	

Drug	Finding	Research Summary	Concern	Evidence
Smoking Cessation				
Bupropion (ANKK1) (Wellbutrin)	ANKK1: One wild type allele and one variant allele.	Individuals with altered function of this gene frequently present with increased risk of pharmacotherapy failure. Be alert to lack of efficacy; consider alternative medication.	Efficacy	
Bupropion (CYP2B6) (Wellbutrin)	CYP2B6: Poor metabolizer. Two decreased function alleles.	Poor metabolizers of this medication may present with notably higher plasma concentrations of the active medication. No additional therapeutic recommendations.		
Sphingosine-1-phosphate receptor modulators				
Siponimod (Mayzent)	CYP2C9: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		

Drug	Finding	Research Summary	Concern	Evidence
Statins				
Atorvastatin (Lipitor, Caduet)	CYP3A4: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Atorvastatin (SLCO1B1) (Lipitor, Caduet)	SLCO1B1: Normal function. Two normal function alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Fluvastatin (SLCO1B1, CYP2C9) (Lescol)	Multigenic: SLCO1B1, CYP2C9: Normal function. Two normal function alleles.; Normal metabolizer. Two normal function alleles.	Individuals with this combination of alleles are expected to show typical response. No additional therapeutic recommendations.		
Lovastatin (SLCO1B1) (Mevacor, Altocor)	SLCO1B1: Normal function. Two normal function alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Pitavastatin (SLCO1B1) (Livazo, Livalo)	SLCO1B1: Normal function. Two normal function alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Pravastatin (SLCO1B1) (Selektine, Pravachol)	SLCO1B1: Normal function. Two normal function alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Rosuvastatin (SLCO1B1, ABCG2) (Rosulip, Crestor, Zuvamor)	Multigenic: SLCO1B1, ABCG2: Normal function. Two normal function alleles.; Normal function. Two normal function alleles.	Individuals with this combination of alleles are expected to show typical response. No additional therapeutic recommendations.		
Simvastatin (Zocor)	SLCO1B1: Normal function. Two normal function alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		

Drug	Finding	Research Summary	Concern	Evidence
Sulfonylurea				
Chlorpropamide (Diabinese)	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Gliclazide (CYP2C9) (Diamicron, Diaprel, Azukon)	CYP2C9: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Glimepiride (CYP2C9) (Amaryl)	CYP2C9: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Glipizide (Glucotrol)	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Glyburide (CYP2C9) (Glibenclamide)	CYP2C9: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Glyburide (G6PD) (Diabeta, Glynase, Micronase, Glibenclamide)	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Tolazamide (Tolinase)	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		
Tolbutamide (CYP2C9) (Orinase)	CYP2C9: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Tetracyclic antidepressants				
Mirtazapine (Remeron)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Typical response expected. No additional therapeutic recommendations.		

Drug	Finding	Research Summary	Concern	Evidence
Thrombopoietin Receptor Agonists				
Avatrombopag (CYP2C9) (Doptelet)	CYP2C9: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Avatrombopag (F2, F5) (Doptelet)	Multigenic: F2, F5: Two wild-type alleles.; Two wild-type alleles.	Individuals with this combination of alleles are expected to show typical response. No additional therapeutic recommendations.		
Eltrombopag (Promacta)	F5: Two wild-type alleles.	Individuals with wild type alleles are expected to show typical response. No additional therapeutic recommendations.		
Lusutrombopag (F2, F5) (Mulpleta)	Multigenic: F2, F5: Two wild-type alleles.; Two wild-type alleles.	Individuals with this combination of alleles are expected to show typical response. No additional therapeutic recommendations.		

Drug	Finding	Research Summary	Concern	Evidence
Tricyclic antidepressants				
Amitriptyline (CYP2C19, CYP2D6) (Elavil)	Multigenic: CYP2D6, CYP2C19: Intermediate metabolizer. One allele showing normal function and one showing little or no function.; Rapid metabolizer. One normal function allele and one increased function allele.	Individuals with this combination of alleles frequently present with significantly increased risk of pharmacotherapy failure. This medication should be avoided.	Efficacy	
Amoxapine (Asendin)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication frequently present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Consider reducing the dose; monitor the patient's response to guide dosing.	ADR	
Clomipramine (CYP2C19, CYP2D6) (Anafranil, Clomicalm)	Multigenic: CYP2D6, CYP2C19: Intermediate metabolizer. One allele showing normal function and one showing little or no function.; Rapid metabolizer. One normal function allele and one increased function allele.	Individuals with this combination of alleles frequently present with significantly increased risk of pharmacotherapy failure. This medication should be avoided.	Efficacy	
Desipramine (Norpramin)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication frequently present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Consider reducing the dose; monitor the patient's response to guide dosing.	ADR	
Doxepin (CYP2C19, CYP2D6) (Quitaxon, Aponal, Sinequan)	Multigenic: CYP2D6, CYP2C19: Intermediate metabolizer. One allele showing normal function and one showing little or no function.; Rapid metabolizer. One normal function allele and one increased function allele.	Individuals with this combination of alleles frequently present with significantly increased risk of pharmacotherapy failure. This medication should be avoided.	Efficacy	

Drug	Finding	Research Summary	Concern	Evidence
Imipramine (CYP2C19, CYP2D6) (Tofranil-PM, Tofranil)	Multigenic: CYP2D6, CYP2C19: Intermediate metabolizer. One allele showing normal function and one showing little or no function.; Rapid metabolizer. One normal function allele and one increased function allele.	Individuals with this combination of alleles frequently present with significantly increased risk of pharmacotherapy failure. This medication should be avoided.	Efficacy	
Nortriptyline (Pamelor)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication frequently present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Consider reducing the dose; monitor the patient's response to guide dosing.	ADR	
Protriptyline (Vivactil)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication frequently present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Consider reducing the dose; monitor the patient's response to guide dosing.	ADR	
Trimipramine (CYP2C19, CYP2D6) (Surmontil)	Multigenic: CYP2D6, CYP2C19: Intermediate metabolizer. One allele showing normal function and one showing little or no function.; Rapid metabolizer. One normal function allele and one increased function allele.	Individuals with this combination of alleles frequently present with significantly increased risk of pharmacotherapy failure. This medication should be avoided.	Efficacy	

Drug	Finding	Research Summary	Concern	Evidence
Typical antipsychotics				
Flupenthixol (Depixol, Fluanxol)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Typical response expected. No additional therapeutic recommendations.		
Haloperidol (Haldol)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		
Perphenazine (Trilafon)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Be alert to adverse reactions; monitor the patient's response to guide dosing.	ADR	
Pimozide (Orap)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication frequently present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Consider reducing the dose; monitor the patient's response to guide dosing.	ADR	
Thioridazine (Mellaril, Melleril)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication frequently present with higher plasma concentrations of the active medication, thus a significantly increased risk of side effects. This medication should be avoided.	ADR	
Zuclopenthixol (Cisordinol, Clopixol)	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Consider reducing the dose, or using an alternative medication.	ADR	
Urate Transporter Inhibitors				
Lesinurad (Zurampic)	CYP2C9: Normal metabolizer. Two normal function alleles.	Normal metabolizers of this medication are expected to show typical response. No additional therapeutic recommendations.		

Drug		Finding	Research Summary	Concern	Evidence
Vasodilator					
Nicorandil (Ikorel)	✓	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		●
Nitroglycerin	✓	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		●
Vesicular monoamine transporter 2 inhibitor					
Deutetrabenazine (Austedo)	⚠	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with notably higher plasma concentrations of the active medication, thus an increased risk of side effects. Consider reducing the dose.	ADR	●
Valbenazine (Ingrezza)	⚠	CYP2D6: Intermediate metabolizer. One allele showing normal function and one showing little or no function.	Intermediate metabolizers of this medication may present with higher plasma concentrations of the active medication, thus an increased risk of side effects. Consider reducing the dose.	ADR	●
Vitamins					
Vitamin C (Ascor, Cecon, Cevalin)	✓	G6PD: Normal function. Two non-deficient (class IV) alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		●
Xanthine Oxidase Inhibitor					
Allopurinol (ABCG2) (Zyloprim)	✓	ABCG2: Normal function. Two normal function alleles.	Individuals with normal function of this gene are expected to show typical response. No additional therapeutic recommendations.		●
Allopurinol (HLA-B*5801) (Zyloprim)	⛔	HLA-B*5801: Positive; One *5801 variant allele detected.	Individuals with these heterozygous alleles frequently present with significantly increased risk of side effects. This medication should be avoided.	ADR	●

Evidence Levels

Strong

- Includes gene-drug pairs supported by multiple studies documenting consistent effects of specific genetic variant(s) on clinical outcomes.
- Includes gene-drug pairs approved by the Coriell Pharmacogenomics Advisory Group.
- Includes gene-drug pairs with guidelines supported by a pharmacogenomics consortium.

Moderate

- Includes gene-drug pairs supported by pharmacokinetic, pharmacodynamic, or molecular/cellular functional studies showing consistent effects of genetic variant(s).
- Includes drug product information from regulatory agency-approved drug labels.
- Includes gene-drug pairs for which potential clinical outcomes are inferred from similar gene-drug interactions with guidelines supported by a pharmacogenomics consortium.

Emerging

- Includes gene-drug pairs supported by published studies of the drug, related drug, or a probing compound of interest involving limited or inconsistent findings.

Patient Information Card

This card contains an abbreviated genetic research summary.
It is not intended as a replacement for the complete CLS PGx Research Review.

Patient: Doe, John
DOB: 01-01-1980
Sample ID: 0000000

This card shows information about your genetics that relate to drug metabolism. Show to your doctors before being prescribed new medications.

Genetic Research Summary		
ABCB1(rs1128503)	G|G	Positive
ABCG2	G|G	Normal function
ADRA2A(c.-1252G>C)	G|C	Positive
ANKK1	G|A	Altered function
ApoE	ε3|ε4	See ApoE Research Summary
ATM(C11orf65)	C|C	Negative
BCHE	WT|WT	Normal function
BDNF	C|C	Normal function
CACNA1C(270344G>A)	G|G	Negative
CACNA1C(5361G>A)	G|A	Positive
COMT (Opioid)	n/a	n/a
COMT(Val158Met)	G|A	Decreased function
CYP1A2	*1A|*1F	Normal metabolizer
CYP2B6	*9/*9	Poor metabolizer
CYP2C	G|G	Negative
CYP2C19	*1|*17	Rapid metabolizer
CYP2C8	*1|*2	Intermediate metabolizer
CYP2C9	*1|*1	Normal metabolizer
CYP2D6	*1|*5	Intermediate metabolizer
CYP3A4	*1|*1	Normal metabolizer
CYP3A5	*1|*3	Intermediate metabolizer
CYP4F2	*1|*1	Normal metabolizer
DBH(-1021C>T)	C|C	Positive
DBH (Opioid)	n/a	n/a
DPYD	Reference/ c.1627A>G (*5)	Normal metabolizer
DRD2/ANKK1 (Opioid)	n/a	n/a
DRD2(-241A>G)	T/T	Negative
Prothrombin (F2)	G/G	Negative
Factor V Leiden (F5)	C|C	Negative
FKBP5(rs1360780)	T|T	Negative
FKBP5(rs4713916)	G|G	Positive
G6PD	B (reference)|B (reference)	Normal function
GRIK1(rs2832407)	A|A	Positive
GRIK4	T|C	Positive
GRIN2B(rs2058878)	T|T	Negative
HLA-A*3101	WT|WT	Negative
HLA-B*1502	WT|*1502	Positive
HLA-B*5701	WT|WT	Negative
HLA-B*5801	WT|*5801	Positive
HTR2A(rs7997012)	rs7997012 G/G	Positive
HTR2C(2565G>C)	G/G	Positive
HTR2C(-759C>T)	C|C	Negative
IFNL3	T|T	Positive
MTHFR (A1298C)	T|T	See Thrombosis Research Summary
MTHFR (C677T)	G|G	See Thrombosis Research Summary
MTHFR (Opioid)	n/a	See Thrombosis Research Summary
NUDT15	*1|*1	Normal metabolizer
OPRD1(rs678849)	C|T	Positive
OPRK1(rs6473797)	T|C	Positive
OPRM1(A118G)	A|A	Normal function
OPRM1 (Opioid)	n/a	n/a
SLCO1B1	*1|*1	Normal function
TPMT	*1|*1	Normal metabolizer
UGT2B15	*1|*2	Decreased function
VKORC1	*1|*2	Medium sensitivity to warfarin

↑ Cut on dotted lines. ↑ Fold Here