Admera Health, LLC
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PATIENT INFORMATION

Name: Smith, John
DOB: October 9, 1973
Age: 45
Sex: Male
Address: 126 Corporate Blvd.
South Plainfield, NJ 07080

SAMPLE

Date Collected: July 13, 2018
Date Received: July 13, 2018
Case ID: PGPSL18-000013
Source: Buccal Swabs

REFERRING PHYSICIAN

Name: Jane Doe, MD
Institution: Admera Test

Comprehensive Drug Information for Smith, John

NORMAL RESPONSE EXPECTED	PROCEED WITH CAUTION	
Drug Impacted	**Drug Impacted**	**Clinical Interpretation**
ADHD: CNS STIMULANTS		
Dexmethylphenidate (Focalin®) Lisdexamfetamine (Vyvanse®) Methamphetamine (Desoxyn®)	Amphetamine/Dextroamphetamine (Adderall®) Dextroamphetamine (Dexedrine®) Methylphenidate (Ritalin®)	Due to increased severity of social withdrawal or nausea
ADHD: SEROTONIN AND NOREPINEPHRINE REUPTAKE INHIBITORS (SNRIS)		
Atomoxetine (Strattera®)		
ALCOHOLISM: ALDEHYDE DEHYDROGENASE INHIBITORS		
Disulfiram (Antabuse®)		
ANTIANXIETY		
Buspirone (Buspar®)		
ANTIANXIETY: BENZODIAZEPINES		
Alprazolam (Xanax®) Lorazepam (Ativan®) Midazolam (Versed®) Oxazepam (Serax®)	Diazepam (Valium®)	Due to possible increased ADRs
ANTIDEPRESSANTS: DOPAMINE/NOREPINEPHRINE-REUPTAKE INHIBITORS		
	Bupropion (Wellbutrin®)	Due to reduced response and increased risk of side effects
ANTIDEPRESSANTS: SELECTIVE SEROTONIN REUPTAKE INHIBITORS (SSRIS)		
Escitalopram (Lexapro®) Vilazodone (Viibryd®) Vortioxetine (Trintellix®)	Citalopram (Celexa®)	Due to reduced response
	Fluoxetine (Prozac®)	Due to elevated risk for drug overdose resulting in adverse events and drug interaction
	Fluvoxamine (Luvox®) Paroxetine (Paxil®) Sertraline (Zoloft®)	Due to reduced response

NORMAL RESPONSE EXPECTED	PROCEED WITH CAUTION	
Drug Impacted	**Drug Impacted**	**Clinical Interpretation**
ANTIDEPRESSANTS: SEROTONIN AND NOREPINEPHRINE REUPTAKE INHIBITORS (SNRIS)		
Duloxetine (Cymbalta®) Levomilnacipran (Fetzima®) Reboxetine (Edronax®)	Milnacipran (Savella®)	Due to reduced response
ANTIDEPRESSANTS: SEROTONIN REUPTAKE INHIBITORS/ANTAGONISTS		
Trazodone (Desyrel®)		
ANTIDEPRESSANTS: ALPHA-2 ANTAGONISTS		
	Mirtazapine (Remeron®)	Due to possible increased ADRs
ANTIPSYCHOTICS		
Aripiprazole (Abilify®) Brexpiprazole (Rexulti®) Haloperidol (Haldol®) Iloperidone (Fanapt®) Perphenazine Pimozide (Orap®)	Chlorpromazine Fluphenazine	Due to possible increased QT interval
	Clozapine (Clozaril®)	Due to increased risk of side effects including hyperprolactinemia and weight gain
	Olanzapine (Zyprexa®) Quetiapine (Seroquel®)	Due to increased risk of side effects
MOOD STABILIZER: ANTIMANIC AGENTS		
Carbamazepine (Tegretol®) Lamotrigine (Lamictal®) Valproic Acid (Depakote®)	Lithium (Lithobid®)	Due to possible less drug response
OPIOID OVERDOSE: OPIOIDS ANTAGONISTS		
Naloxone (Evzio®) Naltrexone (Revia®)		
OTHER STIMULANTS		
Cocaine	Cannabinoids	Due to increased risk of tetrahydrocannabinol (THC) dependence
SUPPLEMENTS: VITAMINS		
Folic Acid		

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Level of Evidence Legend

- ● FDA Actionable PGx – Package insert
- ◖ PharmGKB, CPIC, EMA, DPWG, PMDA, HCSC
- ○ Medical Literature

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I. ICD-10 Diagnosis Code and Current Medication Driven Result for **Smith, John**

ICD-10: F32.9 Major depressive disorder, single episode, unspecified;F41.9 Anxiety disorder, unspecified

Action	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
!	**Alpha-2 Antagonists:**				
	Mirtazapine (Remeron®)	◖	**USE CAUTION** due to possible increased ADRs	**CYP2D6** *4/*10	Intermediate Metabolizer
✓	**Anti-Anxiety Agents:**				
	Buspirone (Buspar®)	○	**NORMAL RESPONSE EXPECTED**	**HTR1A** WT/WT	rs6295 CC genotype/rs1800044 C Allele Carrier
✓	**Anticonvulsant Drugs:**				
	Carbamazepine (Tegretol®)	◖	**NORMAL RESPONSE EXPECTED**	**SCN2A** WT/WT	rs2304016 non-GG genotype
	Lamotrigine (Lamictal®)	◖			
	Oxcarbazepine (Trileptal®)	◖			
	Phenytoin (Dilantin®)	◖			
	Topiramate (Topamax®)	◖			
✓	**Anticonvulsant Drugs:**				
	Clobazam (Onfi®)	●	**NORMAL RESPONSE EXPECTED**	**CYP2C19** *1/*2	Intermediate Metabolizer
✓	**Anticonvulsant Drugs:**				
	Valproic Acid (Depakote®)	◖	**NORMAL RESPONSE EXPECTED**	**ANKK1** WT/c.2137G>A	A1 Heterozygous
!	**Antimanic Agents:**				
	Lithium (Lithobid®)	◖	**USE CAUTION** due to possible less drug response	**ABCB1** WT/WT	rs2032582 AA genotype/rs1045642 AA genotype
✗	**Antipsychotics:**				
	Risperidone (Risperdal®)	●	**CONSIDER ALTERNATIVES** (e.g., quetiapine, olanzapine, clozapine)	**CYP2D6** *4/*10	Intermediate Metabolizer

Action	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
	Antipsychotics:				
	Thioridazine (Mellaril®)	●	**CONSIDER ALTERNATIVES**	**CYP2D6** *4/*10	Intermediate Metabolizer
	Antipsychotics:				
	Chlorpromazine Fluphenazine	◖ ◖	**USE CAUTION** due to possible increased QT interval	**CYP1A2** *1A/*1F	Normal Metabolizer
	Antipsychotics:				
	Clozapine (Clozaril®)	◖	**USE CAUTION** due to increased risk of side effects including hyperprolactinemia and weight gain	**ANKK1** WT/c.2137G>A	A1 Heterozygous
	Antipsychotics:				
	Clozapine (Clozaril®)	◖	**USE CAUTION** due to increased risk of developing metabolic syndrome	**HTR2C** WT/WT	rs1414334 C Allele Carrier
	Antipsychotics:				
	Olanzapine (Zyprexa®) Quetiapine (Seroquel®)	◖ ◖	**USE CAUTION** due to increased risk of side effects	**SLC6A4** LA/LA	HTTLPR Long Form
	Antipsychotics:				
	Olanzapine (Zyprexa®)	◖	**USE CAUTION** due to increased risk of side effects including hyperprolactinemia and weight gain	**ANKK1** WT/c.2137G>A	A1 Heterozygous
	Antipsychotics:				
	Olanzapine (Zyprexa®)	◖	**USE CAUTION** due to increased risk of developing metabolic syndrome	**HTR2C** WT/WT	rs1414334 C Allele Carrier
	Antipsychotics:				
	Aripiprazole (Abilify®) Brexpiprazole (Rexulti®) Iloperidone (Fanapt®) Pimozide (Orap®)	● ● ● ●	**NORMAL RESPONSE EXPECTED**	**CYP2D6** *4/*10	Intermediate Metabolizer

Action	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
✓	**Antipsychotics:**				
	Aripiprazole (Abilify®)	◖	NORMAL RESPONSE EXPECTED	**CYP3A4** *1A/*1B	Intermediate Metabolizer
✓	**Antipsychotics:**				
	Haloperidol (Haldol®)	◖	NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer
✓	**Antipsychotics:**				
	Perphenazine	●	NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer
✓	**Antirheumatic Immunosuppressants:**				
	Methotrexate (Trexall®)	◖	NORMAL RESPONSE EXPECTED	**ITPA** WT/WT	Non-protective Wild Type
!	**Benzodiazepines:**				
	Diazepam (Valium®)	●	USE CAUTION due to possible increased ADRs	**CYP2C19** *1/*2	Intermediate Metabolizer
✓	**Benzodiazepines:**				
	Alprazolam (Xanax®)	○	NORMAL RESPONSE EXPECTED	**CYP3A4** *1A/*1B	Intermediate Metabolizer
✓	**Benzodiazepines:**				
	Lorazepam (Ativan®)	◖	NORMAL RESPONSE EXPECTED	**UGT2B15** *1/*2	rs1902023 non-AA genotype
	Oxazepam (Serax®)	◖			
✓	**Benzodiazepines:**				
	Midazolam (Versed®)	◖	NORMAL RESPONSE EXPECTED	**CYP3A5** *1A/*3A	Expresser

Action	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
!	**Dopamine/Norepinephrine-Reuptake Inhibitors:**				
	Bupropion (Wellbutrin®)	◖	**USE CAUTION** due to reduced response and increased risk of side effects	**CYP2B6** G516T/G516T/A785G/A785G	G516T Homozygous/A785G Homozygous
!	**Dopamine/Norepinephrine-Reuptake Inhibitors:**				
	Bupropion (Wellbutrin®)	◖	**USE CAUTION** due to reduced response and increased risk of side effects	**CYP2C19** *1/*2	Intermediate Metabolizer
!	**Folate Antimetabolites:**				
	Methotrexate (Trexall®)	◖	**USE CAUTION** due to increased risk of toxicity caused by increased drug concentration	**ABCB1** WT/WT	rs2032582 AA genotype/rs1045642 AA genotype
✖	**Opioids:**				
	Codeine (Codeine®)	◖	**CONSIDER ALTERNATIVES** if no response	**CYP2D6** *4/*10	Intermediate Metabolizer
	Codeine/Acetaminophen (Tylenol #3 & #4®)	◖			
	Hydrocodone/Acetaminophen (Vicodin®)	◖			
	Oxycodone (Oxycontin®)	◖			
✖	**Opioids:**				
	Tramadol Hydrochloride/Acetaminophen (Ultracet®)	●	**CONSIDER ALTERNATIVES** (not oxycodone, codeine)	**CYP2D6** *4/*10	Intermediate Metabolizer
	Tramadol (Ultram®)	●	OR		
▲			**INCREASE DOSE**		
▼	**Opioids:**				
	Buprenorphine (Subutex®)	○	**DECREASE DOSE**	**CYP3A4** *1A/*1B	Intermediate Metabolizer
	Fentanyl (Duragesic®)	○			
	Sufentanil (Sufenta®)	○	OR		
!			**USE CAUTION** due to the risk of increased exposure to the drug leading to adverse events		

Action	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
!	**Selective Serotonin Reuptake Inhibitors (SSRIs):**				
	Citalopram (Celexa®)	◖	**USE CAUTION** due to reduced response	**GRIK4** WT/WT	rs1954787 T Allele Carrier
!	**Selective Serotonin Reuptake Inhibitors (SSRIs):**				
	Fluoxetine (Prozac®)	●	**USE CAUTION** due to elevated risk for drug overdose resulting in adverse events and drug interaction	**CYP2D6** *4/*10	Intermediate Metabolizer
!	**Selective Serotonin Reuptake Inhibitors (SSRIs):**				
	Fluvoxamine (Luvox®)	◖	**USE CAUTION** due to reduced response	**HTR1A** WT/WT	rs6295 CC genotype/rs1800044 C Allele Carrier
	Paroxetine (Paxil®)	◖			
	Sertraline (Zoloft®)	◖			
!	**Selective Serotonin Reuptake Inhibitors (SSRIs):**				
	Sertraline (Zoloft®)	◖	**USE CAUTION** with high alert to adverse drug events	**CYP2C19** *1/*2	Intermediate Metabolizer
✓	**Selective Serotonin Reuptake Inhibitors (SSRIs):**				
	Escitalopram (Lexapro®)	●	**NORMAL RESPONSE EXPECTED**	**CYP2C19** *1/*2	Intermediate Metabolizer
✓	**Selective Serotonin Reuptake Inhibitors (SSRIs):**				
	Escitalopram (Lexapro®)	◖	**NORMAL RESPONSE EXPECTED**	**SLC6A4** LA/LA	HTTLPR Long Form
✓	**Selective Serotonin Reuptake Inhibitors (SSRIs):**				
	Vilazodone (Viibryd®)	○	**NORMAL RESPONSE EXPECTED**	**CYP3A4** *1A/*1B	Intermediate Metabolizer
✓	**Selective Serotonin Reuptake Inhibitors (SSRIs):**				
	Vortioxetine (Trintellix®)	●	**NORMAL RESPONSE EXPECTED**	**CYP2D6** *4/*10	Intermediate Metabolizer

Action	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
	Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs):				
	Venlafaxine (Effexor®)	●	**CONSIDER ALTERNATIVES** (e.g., citalopram, sertraline)	**CYP2D6** *4/*10	Intermediate Metabolizer
	Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs):				
	Milnacipran (Savella®)	◖	**USE CAUTION** due to reduced response	**ADRA2A** WT/c.-217G>A	rs1800544 GG genotype/rs1800545 GA genotype
	Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs):				
	Milnacipran (Savella®)	◖	**USE CAUTION** due to reduced response	**HTR1A** WT/WT	rs6295 CC genotype/rs1800044 C Allele Carrier
	Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs):				
	Duloxetine (Cymbalta®)	○	**NORMAL RESPONSE EXPECTED**	**CYP1A2** *1A/*1F	Normal Metabolizer
	Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs):				
	Levomilnacipran (Fetzima®)	○	**NORMAL RESPONSE EXPECTED**	**CYP3A4** *1A/*1B	Intermediate Metabolizer
	Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs):				
	Reboxetine (Edronax®)	○	**NORMAL RESPONSE EXPECTED**	**CYP3A4** *1A/*1B	Intermediate Metabolizer
	Serotonin Reuptake Inhibitors/Antagonists:				
	Trazodone (Desyrel®)	○	**NORMAL RESPONSE EXPECTED**	**CYP3A4** *1A/*1B	Intermediate Metabolizer
	Tetracyclic Antidepressants:				
	Maprotiline	◖	**DECREASE DOSE**	**CYP2D6** *4/*10	Intermediate Metabolizer

Action	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
▼	**Tricyclic Antidepressants:**				
	Amitriptyline (Elavil®) Clomipramine (Anafranil®) Doxepin (Silenor®) Imipramine (Tofranil®) Protriptyline (Vivactil®) Trimipramine (Surmontil®)	● ● ● ● ● ●	**DECREASE DOSE** by 25%	**CYP2D6** *4/*10	Intermediate Metabolizer
▼	**Tricyclic Antidepressants:**				
	Desipramine (Norpramin®) Nortriptyline (Pamelor®)	● ●	**DECREASE DOSE** by 25%	**CYP2D6** *4/*10	Intermediate Metabolizer
✓	**Vitamins:**				
	Folic Acid	◖	**NORMAL RESPONSE EXPECTED**	**MTHFR** WT/WT	Wild Type

Disclaimer: The ICD-10 codes page may be left blank because ICD codes were not provided or not applicable.

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II. Current Medication List for
Smith, John

Action	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
✓	**Anticonvulsant Drugs:**				
	Lamotrigine	◖	**NORMAL RESPONSE EXPECTED**	**SCN2A** WT/WT	rs2304016 non-GG genotype
✓	**Antirheumatic Immunosuppressants:**				
	Methotrexate	◖	**NORMAL RESPONSE EXPECTED**	**ITPA** WT/WT	Non-protective Wild Type
!	**Folate Antimetabolites:**				
	Methotrexate	◖	**USE CAUTION** due to increased risk of toxicity caused by increased drug concentration	**ABCB1** WT/WT	rs2032582 AA genotype/rs1045642 AA genotype
✗	**Opioids:**				
	Acetaminophen	◖	**CONSIDER ALTERNATIVES** if no response	**CYP2D6** *4/*10	Intermediate Metabolizer
✓	**Vitamins:**				
	Folic Acid	◖	**NORMAL RESPONSE EXPECTED**	**MTHFR** WT/WT	Wild Type
?	**Beta Blockers:**				
	Timolol	NA	**CLINICAL EVIDENCE NOT SUFFICIENT**	**CYP2D6** *4/*10	Intermediate Metabolizer
?	**Nonsteroidal Anti-Inflammatory Drugs (NSAIDs):**				
	Aspirin	NA	**CLINICAL EVIDENCE NOT SUFFICIENT**	**CYP2C19** *1/*2	Intermediate Metabolizer
NA	**Anticonvulsants:**				
	Levetiracetam	NA	**CLINICAL INTERPRETATION NOT AVAILABLE**	NA	NA
NA	**Antifungal Agents:**				
	Nystatin	NA	**PHARMACOGENOMICS EVIDENCE NOT AVAILABLE**	NA	NA
NA	**Hormones:**				
	Megestrol	NA	**PHARMACOGENOMICS EVIDENCE NOT AVAILABLE**	NA	NA

Action	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
NA	**Vitamins:**				
	Multivitamins Cholecalciferol	NA	**PHARMACOGENOMICS EVIDENCE NOT AVAILABLE**	NA	NA

Drug-Drug Interactions for
Smith, John

Severity	Drugs	Warning	Documentation	Clinical Management
S	METHOTREXATE SODIUM -- ASPIRIN	**MAJOR** Concurrent use of ASPIRIN and METHOTREXATE may result in methotrexate toxicity (leukopenia, thrombocytopenia, anemia, nephrotoxicity, mucosal ulcerations).	GOOD	In general, do not administer salicylates within 10 days of high-dose methotrexate (ie, doses used in cancer therapy). If concomitant administration is necessary, monitor closely for toxicity, especially myelosuppression and gastrointestinal toxicity. Concomitant administration of low-dose methotrexate (ie, doses used for arthritis, 7.5 to 15 mg per week) and NSAIDS has been well tolerated in many patients; however, caution is advised. Higher doses of methotrexate, such as those used in psoriasis, have not been evaluated with concomitant salicylates administration.
S	METHOTREXATE SODIUM -- LEVETIRACETAM	**MAJOR** Concurrent use of LEVETIRACETAM and METHOTREXATE may result in increased risk of methotrexate exposure and toxicity.	GOOD	Concomitant use of methotrexate and levetiracetam may result in an increased methotrexate exposure and toxicity. If delayed methotrexate elimination occurs when coadministered levetiracetam, substitution of levetiracetam may be beneficial. When possible, consider temporarily switching from levetiracetam to another antiepileptic agent, especially in patients with a history of delayed methotrexate elimination with levetiracetam coadministration or in those at a greater risk for methotrexate toxicity (Bain et al, 2014).
!	ASPIRIN -- TIMOLOL MALEATE	**MODERATE** Concurrent use of BETA-ADRENERGIC BLOCKERS and NSAIDS may result in increased blood pressure.	GOOD	The antihypertensive efficacy of beta blockers may be decreased when used concomitantly with NSAIDs. Monitor blood pressure when coadministration is required (Prod Info ZORVOLEX® oral capsules, 2016; Prod Info ANAPROX® DS oral tablets, 2016; Prod Info CALDOLOR® intravenous injection, 2016).

Drug-Food Interactions for
Smith, John

Severity	Drugs	Warning	Documentation	Clinical Management
S	METHOTREXATE SODIUM -- COLA	**MAJOR** Concurrent use of METHOTREXATE and COLA may result in increased methotrexate serum levels and increased risk of toxicity.	EXCELLENT	Consumption of cola beverages, which contains high amounts of inorganic acids, concomitantly with methotrexate, may result in delayed methotrexate elimination, increase serum levels, and an increase risk of nephrotoxicity. Cola beverages should be avoided until methotrexate clearance has been confirmed (Bauters et al, 2013).
!	ACETAMINOPHEN -- CABBAGE	**MODERATE** Concurrent use of ACETAMINOPHEN and CABBAGE may result in decreased acetaminophen effectiveness.	GOOD	Use caution if cabbage is used concomitantly with acetaminophen.
!	ASCORBIC ACID/CYANOCOBALAMIN/FOLIC ACID/NIACINAMIDE/PYRIDOXINE/RIBOFLAVIN/THIAMINE/VITAMIN A/VITAMIN D/VITAMIN E -- FOOD	**MODERATE** Concurrent use of PYRIDOXINE and FOOD may result in decreased pyridoxine exposure.	EXCELLENT	Concomitant administration with food delayed and decreased pyridoxine absorption, lowering overall pyridoxine exposure. Administer pyridoxine on an empty stomach with a glass of water (Prod Info DICLEGIS® oral delayed-release tablets, 2013).
!	ASPIRIN -- CELERY	**MODERATE** Concurrent use of ANTIPLATELET AGENTS and CELERY may result in increased risk of bleeding.	FAIR	Avoid concomitant use of celery with antiplatelet agents. If both are taken together monitor the patient closely for signs and symptoms of bleeding.

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Drug-Alcohol Interactions for
Smith, John

Severity	Drugs	Warning	Documentation	Clinical Management
S	ACETAMINOPHEN -- ETHANOL	**MAJOR** Concurrent use of ETHANOL and ACETAMINOPHEN may result in an increased risk of hepatotoxicity.	GOOD	Caution should be used with patients who drink 3 or more alcoholic beverages per day and take acetaminophen. Patients should be advised not to exceed 4 grams of acetaminophen per 24 hours. Chronic alcoholics should avoid the use of acetaminophen. In cases of acetaminophen overdose consider treatment with acetylcysteine.
!	ASPIRIN -- ETHANOL	**MODERATE** Concurrent use of ETHANOL and ASPIRIN may result in increased risk of gastrointestinal bleeding.	GOOD	Concomitant use of alcohol and aspirin may increase the risk of gastrointestinal injury and bleeding and should be undertaken with caution. Chronic or heavy alcohol consumption may increase this risk (Prod Info DuoCover oral film coated tablets, 2016).
!	METHOTREXATE SODIUM -- ETHANOL	**MODERATE** Concurrent use of ETHANOL and METHOTREXATE may result in increased hepatotoxicity.	FAIR	Patients taking methotrexate should minimize or avoid the consumption of ethanol.

Drug-Lab Interactions for
Smith, John

Severity	Drugs	Warning	Documentation	Clinical Management
S	LAMOTRIGINE -- URINE PHENCYCLIDINE SCREENING TEST	**MAJOR** LAMOTRIGINE may result in false-positive result due to assay interference.	FAIR	Lamotrigine may cause false-positive results for phencyclidine (PCP) through interference with the assay used in some rapid urine drug screens. Confirm positive results with more specific analyses (Prod Info LAMICTAL® oral tablets, oral chewable dispersible tablets, 2014).
S	LAMOTRIGINE -- URINE DRUG SCREENING	**MAJOR** LAMOTRIGINE may result in false-positive result due to assay interference.	FAIR	Lamotrigine may cause false-positive results in some rapid urine drug screens via assay interference. Confirm positive results with more specific analyses (Prod Info LAMICTAL® oral tablets, oral chewable dispersible tablets, 2014).
!	ACETAMINOPHEN -- URIC ACID MEASUREMENT	**MODERATE** ACETAMINOPHEN may result in falsely increased serum uric acid levels due to assay interference with the phosphotungstate reduction method.	GOOD	Consider using the enzymatic uricase method to determine serum uric acid concentrations in patients who have taken acetaminophen.
!	ASCORBIC ACID/CYANOCOBALAMIN/FOLIC ACID/NIACINAMIDE/PYRIDOXINE/RIBOFLAVIN/THIAMINE/VITAMIN A/VITAMIN D/VITAMIN E -- GLUCOSE MEASUREMENT	**MODERATE** ASCORBIC ACID may result in inaccurate glucose readings due to assay interference by ascorbic acid.	GOOD	The presence of ascorbic acid (a strong reducing agent) in the blood can lead to inaccurate results (false positive or negative (Tang et al, 2000)) on oxidation-reduction reactions such as blood or urine glucose tests if used during or within 24 hours of an ascorbic acid infusion. Chemical detecting methods based on colorimetric reactions may be affected. When possible, delay such a test until 24 hours after IV infusion of ascorbic acid (Prod Info ASCOR® intravenous injection, 2017) or after taking large doses of ascorbic acid.
!	ASCORBIC ACID/CYANOCOBALAMIN/FOLIC ACID/NIACINAMIDE/PYRIDOXINE/RIBOFLAVIN/THIAMINE/VITAMIN A/VITAMIN D/VITAMIN E -- METHADONE MEASUREMENT	**MODERATE** DOXYLAMINE/PYRIDOXINE may result in false-positive urine drug screen for methadone due to mechanism unknown.	FAIR	False-positive methadone drug screens have been reported with concomitant use of doxylamine succinate/pyridoxine hydrochloride. Confirm the identity of the substance in the event of a positive immunoassay result with confirmatory tests, such as Gas Chromatography Mass Spectrometry (Prod Info BONJESTA® oral extended-release tablets, 2018).

Severity	Drugs	Warning	Documentation	Clinical Management
!	ASCORBIC ACID/CYANOCOBALAMIN/FOLIC ACID/NIACINAMIDE/PYRIDOXINE/RIBOFLAVIN/THIAMINE/VITAMIN A/VITAMIN D/VITAMIN E -- URINE	**MODERATE** DOXYLAMINE/PYRIDOXINE may result in false-positive urine drug screen for methadone due to mechanism unknown.	FAIR	False-positive methadone drug screens have been reported with concomitant use of doxylamine succinate/pyridoxine hydrochloride. Confirm the identity of the substance in the event of a positive immunoassay result with confirmatory tests, such as Gas Chromatography Mass Spectrometry (Prod Info BONJESTA® oral extended-release tablets, 2018).
!	ASCORBIC ACID/CYANOCOBALAMIN/FOLIC ACID/NIACINAMIDE/PYRIDOXINE/RIBOFLAVIN/THIAMINE/VITAMIN A/VITAMIN D/VITAMIN E -- PHENCYCLIDINE MEASUREMENT	**MODERATE** DOXYLAMINE/PYRIDOXINE may result in false-positive urine drug screen for phencyclidine due to mechanism unknown.	FAIR	False-positive phencyclidine drug screens have been reported with concomitant use of doxylamine succinate/pyridoxine hydrochloride. Confirm the identity of the substance in the event of a positive immunoassay result with confirmatory tests, such as Gas Chromatography Mass Spectrometry (Prod Info BONJESTA® oral extended-release tablets, 2018).
!	ASCORBIC ACID/CYANOCOBALAMIN/FOLIC ACID/NIACINAMIDE/PYRIDOXINE/RIBOFLAVIN/THIAMINE/VITAMIN A/VITAMIN D/VITAMIN E -- URINE OPIATE MEASUREMENT	**MODERATE** DOXYLAMINE/PYRIDOXINE may result in false-positive urine drug screen for opiates due to mechanism unknown.	FAIR	False-positive opiate drug screens have been reported with concomitant use of doxylamine succinate/pyridoxine hydrochloride. Confirm the identity of the substance in the event of a positive immunoassay result with confirmatory tests, such as Gas Chromatography Mass Spectrometry (Prod Info BONJESTA® oral extended-release tablets, 2018).

Disclaimer: The Current Medication section may be left blank if no medication list provided. The Drug Interactions section may be left blank if no drug interactions were found for drugs on the current medication list or no medication list was provided.

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III. Summary Psychiatric Drugs for
Smith, John

Drugs by Drug Class	ABCB1	ADRA2A	ANKK1	CES1	CNR1	COMT	CYP1A2	CYP2B6	CYP2C19	CYP2D6	CYP3A4	CYP3A5	DRD1	DRD2	FAAH	GRIK4	HLA-B	HTR1A	HTR2A	HTR2C	OPRM1	SCN2A	SLC6A4	UGT2B15	Final recommendation
ALDEHYDE DEHYDROGENASE INHIBITORS																									
Disulfiram (Antabuse®)			×																						
ANTI-ANXIETY AGENTS																									
Alprazolam (Xanax®)											×														
Buspirone (Buspar®)																		×							
Diazepam (Valium®)									×																
Lorazepam (Ativan®)																								×	
Midazolam (Versed®)												×													
Oxazepam (Serax®)																								×	
Propranolol (Inderal LA®)										×															
ANTIDEPRESSANTS																									
Amitriptyline (Elavil®)									×	×															
Bupropion (Wellbutrin®)								×	×																
Citalopram (Celexa®)									×							×			×				×		
Clomipramine (Anafranil®)									×	×															
Desipramine (Norpramin®)										×															
Doxepin (Silenor®)									×	×															
Duloxetine (Cymbalta®)							×																		
Escitalopram (Lexapro®)									×														×		
Fluoxetine (Prozac®)										×															
Fluvoxamine (Luvox®)										×								×							
Imipramine (Tofranil®)									×	×															
Levomilnacipran (Fetzima®)											×														
Maprotiline										×															
Milnacipran (Savella®)		×																×							
Mirtazapine (Remeron®)										×															
Nortriptyline (Pamelor®)										×															
Paroxetine (Paxil®)										×								×							
Protriptyline (Vivactil®)									×	×															
Reboxetine (Edronax®)											×														
Sertraline (Zoloft®)									×									×							
Trazodone (Desyrel®)											×														
Trimipramine (Surmontil®)									×	×															
Venlafaxine (Effexor®)										×															
Vilazodone (Viibryd®)											×														
Vortioxetine (Trintellix®)										×															

Drugs by Drug Class	ABCB1	ADRA2A	ANKK1	CES1	CNR1	COMT	CYP1A2	CYP2B6	CYP2C19	CYP2D6	CYP3A4	CYP3A5	DRD1	DRD2	FAAH	GRIK4	HLA-B	HTR1A	HTR2A	HTR2C	OPRM1	SCN2A	SLC6A4	UGT2B15	Final recommendation
ANTIMANIC AGENTS																									
Lithium (Lithobid®)	×																								
ANTIPSYCHOTICS																									
Aripiprazole (Abilify®)										×	×														
Brexpiprazole (Rexulti®)										×															
Chlorpromazine							×																		
Clozapine (Clozaril®)			×				×			×										×					
Fluphenazine							×																		
Haloperidol (Haldol®)										×															
Iloperidone (Fanapt®)										×															
Olanzapine (Zyprexa®)			×				×													×			×		
Perphenazine										×															
Pimozide (Orap®)										×															
Quetiapine (Seroquel®)															×								×		
Risperidone (Risperdal®)			×							×				×						×			×		
Thioridazine (Mellaril®)										×															
CNS Stimulants (ADHD)																									
AMP/D-AMPH* (Adderall®)						×							×								×				
Atomoxetine (Strattera®)										×															
Dexmethylphenidate (Focalin®)						×																			
Dextroamphetamine (Dexedrine®)						×							×												
Lisdexamfetamine (Vyvanse®)						×																			
Methamphetamine (Desoxyn®)															×										
Methylphenidate (Ritalin®)				×		×							×												
MOOD STABILIZERS																									
Carbamazepine (Tegretol®)																	×					×			
Lamotrigine (Lamictal®)																						×			
Valproic Acid (Depakote®)			×																						
OPIOIDS ANTAGONISTS																									
Naloxone (Evzio®)																					×				
Naltrexone (Revia®)																					×				
OTHER STIMULANTS																									
Cannabinoids															×										
Cocaine					×																				

*AMP/D-AMPH: Amphetamine/Dextroamphetamine

Consider Alternative | Normal Response Expected | Increase Dose | Decrease Dose | Proceed With Caution | Minor Pathway

IV. Comprehensive Drug List for
Smith, John

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Anesthesiology	**General Anesthetics:**				
	Ketamine (Ketalar®) Propofol (Diprivan®)	◖ ◖	**DECREASE DOSE** due to decreased drug clearance	**CYP2B6** G516T/G516T/A785G/A785G	G516T Homozygous/A785G Homozygous
Anesthesiology	**Local Anesthetics:**				
	Lidocaine/Prilocaine (Emla®)	●	**CONSIDER ALTERNATIVES** due to high susceptibility to drug-induced methemoglobinemia	**G6PD** WT/Mediterranean	G6PD Deficiency
Anesthesiology	**Local Anesthetics:**				
	Lidocaine (Lidoderm®) Ropivacaine (Naropin®)	○ ○	**NORMAL RESPONSE EXPECTED**	**CYP1A2** *1A/*1F	Normal Metabolizer
Anesthesiology	**Sedatives:**				
	Dexmedetomidine (Precedex®)	◖	**NORMAL RESPONSE EXPECTED**	**ADRA2A** WT/c.-217G>A	rs1800544 GG genotype/rs1800545 GA genotype
Cardiology	**ACE Inhibitors:**				
	Captopril (Capoten®) Quinapril (Accupril®)	◖ ◖	**USE CAUTION** due to reduced response	**ACE** WT/WT	ACE Deletion
Cardiology	**ACE Inhibitors:**				
	Benazepril (Lotensin®) Perindopril (Aceon®)	◖ ◖	**NORMAL RESPONSE EXPECTED**	**ACE** WT/WT	ACE Deletion
Cardiology	**ACE Inhibitors:**				
	Perindopril (Aceon®)	◖	**NORMAL RESPONSE EXPECTED**	**AGTR1** WT/WT	rs5186 AA genotype
Cardiology	**Angiotensin II Receptor Blockers:**				
	Irbesartan (Avapro®)	◖	**USE CAUTION** due to reduced response	**ACE** WT/WT	ACE Deletion

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Cardiology	**Angiotensin II Receptor Blockers:**				
	Losartan (Cozaar®)	◖	**USE CAUTION** due to reduced response	**AGTR1** WT/WT	rs5186 AA genotype
Cardiology	**Angiotensin II Receptor Blockers:**				
	Candesartan (Atacand®)	◖	**NORMAL RESPONSE EXPECTED**	**AGTR1** WT/WT	rs5186 AA genotype
Cardiology	**Antianginal Drugs:**				
	Ranolazine (Ranexa®)	◖	**NORMAL RESPONSE EXPECTED**	**CYP2D6** *4/*10	Intermediate Metabolizer
Cardiology	**Antiarrhythmic Drugs:**				
	Propafenone (Rythmol®)	●	**CONSIDER ALTERNATIVES** (e.g., sotalol, disopyramide, quinidine, amiodarone)	**CYP2D6** *4/*10	Intermediate Metabolizer
Cardiology	**Antiarrhythmic Drugs:**				
	Flecainide (Tambocor®)	◖	**DECREASE DOSE** by 25%	**CYP2D6** *4/*10	Intermediate Metabolizer
Cardiology	**Antiarrhythmic Drugs:**				
	Digoxin (Lanoxin®)	◖	**USE CAUTION** due to decreased metabolism	**ABCB1** WT/WT	rs2032582 AA genotype/rs1045642 AA genotype
Cardiology	**Antiarrhythmic Drugs:**				
	Amiodarone (Cordarone®)	◖	**NORMAL RESPONSE EXPECTED**	**NOS1AP** WT/WT	rs10494366 GG genotype/rs10800397 C Allele Carrier/rs10919035 C Allele Carrier
Cardiology	**Antiarrhythmic Drugs:**				
	Dronedarone (Multaq®)	◖	**NORMAL RESPONSE EXPECTED**	**CYP3A4** *1A/*1B	Intermediate Metabolizer

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Cardiology	**Anticoagulants:**				
	Phenprocoumon (Marcoumar®)	◖	✓ NORMAL RESPONSE EXPECTED	**CYP4F2** *1/*1	Normal Metabolizer
Cardiology	**Anticoagulants:**				
	Rivaroxaban (Xarelto®)	○	✓ NORMAL RESPONSE EXPECTED	**CYP3A4** *1A/*1B	Intermediate Metabolizer
Cardiology	**Anticoagulants:**				
	Warfarin (Coumadin®)	●	✓ NORMAL DOSE Warfarin daily dose 5-7mg	**CYP2C9** *1/*1	Normal Metabolizer
Cardiology	**Anticoagulants:**				
	Warfarin (Coumadin®)	●	✓ NORMAL DOSE Warfarin daily dose 5-7mg	**VKORC1** WT/-1639G>A	rs9923231 A Allele Carrier
Cardiology	**Antilipemic Agents:**				
	Fenofibrate (Tricor®)	○	✓ NORMAL RESPONSE EXPECTED	**APOB** c.8216C>T/c.8216C>T	rs676210 AA Genotype
Cardiology	**Antilipemic Agents:**				
	Fenofibrate (Tricor®)	◖	✓ NORMAL RESPONSE EXPECTED	**APOE** WT/WT	Non E2 Carrier
Cardiology	**Antilipemic Agents (Statins):**				
	Atorvastatin (Lipitor®) Pravastatin (Pravachol®)	◖ ◖	! USE CAUTION due to poorer response to statin treatment with decreased risk for adverse cardiovascular events	**KIF6** WT/WT	rs20455 AA genotype
Cardiology	**Antilipemic Agents (Statins):**				
	Atorvastatin (Lipitor®)	◖	! USE CAUTION due to higher risk of developing myalgia	**ABCB1** WT/WT	rs2032582 AA genotype/rs1045642 AA genotype
Cardiology	**Antilipemic Agents (Statins):**				
	Lovastatin (Mevacor®) Rosuvastatin (Crestor®)	◖ ◖	✓ NORMAL RESPONSE EXPECTED	**CYP3A5** *1A/*3A	Expresser

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Cardiology	**Antilipemic Agents (Statins):**				
	Pitavastatin (Livalo®) Rosuvastatin (Crestor®)	◖ ◖	✓ **NORMAL RESPONSE EXPECTED**	**SLCO1B1** *1/*1	Normal Activity
Cardiology	**Antilipemic Agents (Statins):**				
	Fluvastatin (Lescol®)	◖	✓ **NORMAL RESPONSE EXPECTED**	**ACE** WT/WT	ACE Deletion
Cardiology	**Antilipemic Agents (Statins):**				
	Lovastatin (Mevacor®)	○	✓ **NORMAL RESPONSE EXPECTED**	**LDLR** c.1773C>T/c.1773C>T	rs688 TT Genotype
Cardiology	**Antilipemic Agents (Statins):**				
	Simvastatin (Zocor®)	◖	✓ **NORMAL RESPONSE EXPECTED**	**ABCB1** WT/WT	rs2032582 AA genotype/rs1045642 AA genotype
Cardiology	**Antilipemic Agents (Statins):**				
	Simvastatin (Zocor®)	◖	✓ **NORMAL RESPONSE EXPECTED**	**SLCO1B1** *1/*1	Normal Activity
Cardiology	**Antiplatelets:**				
	Clopidogrel (Plavix®)	●	✗ **CONSIDER ALTERNATIVES** (if no contraindication e.g., prasugrel, ticagrelor)	**CYP2C19** *1/*2	Intermediate Metabolizer
Cardiology	**Antiplatelets:**				
	Ticagrelor (Brilinta®)	●	✓ **NORMAL DOSE**	**CYP2C19** *1/*2	Intermediate Metabolizer

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Cardiology	**Beta Blockers:**				
	Metoprolol (Lopressor®)	●	**CONSIDER ALTERNATIVES** (e.g., bisoprolol, carvedilol) OR **DECREASE DOSE** by 50% due to heart failure caused by the decreased drug cardioselectivity	**CYP2D6** *4/*10	Intermediate Metabolizer
Cardiology	**Beta Blockers:**				
	Atenolol (Tenormin®)	◖	**USE CAUTION** due to decreased drug response	**ADRA2A** WT/c.-217G>A	rs1800544 GG genotype/rs1800545 GA genotype
Cardiology	**Beta Blockers:**				
	Carvedilol (Coreg®)	●	**NORMAL RESPONSE EXPECTED**	**CYP2D6** *4/*10	Intermediate Metabolizer
Cardiology	**Beta Blockers:**				
	Nebivolol (Bystolic®) Propranolol (Inderal LA®)	● ●	**NORMAL RESPONSE EXPECTED**	**CYP2D6** *4/*10	Intermediate Metabolizer
Cardiology	**Calcium Channel Blockers:**				
	Amlodipine (Norvasc®) Nifedipine (Adalat®)	◖ ○	**USE CAUTION** due to increased risk for QTc prolongation	**NOS1AP** WT/WT	rs10494366 GG genotype/rs10800397 C Allele Carrier/rs10919035 C Allele Carrier
Cardiology	**Calcium Channel Blockers:**				
	Verapamil (Calan®)	◖	**USE CAUTION** due to increased risk for QTc prolongation	**NOS1AP** WT/WT	rs10494366 GG genotype/rs10800397 C Allele Carrier/rs10919035 C Allele Carrier
Cardiology	**Calcium Channel Blockers:**				
	Diltiazem (Cardizem®) Felodipine (Plendil®) Lercanidipine (Zanidip®) Nisoldipine (Sular®)	○ ○ ○ ○	**NORMAL RESPONSE EXPECTED**	**CYP3A4** *1A/*1B	Intermediate Metabolizer
Cardiology	**Calcium Channel Blockers:**				
	Nitrendipine (Nitrepin®)	◖	**NORMAL RESPONSE EXPECTED**	**AGTR1** WT/WT	rs5186 AA genotype

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Cardiology	**Diuretics:**				
	Bumetanide (Bumex®) Furosemide (Lasix®) Hydrochlorothiazide (Microzide®) Torsemide (Demadex®)	◖	✓ NORMAL RESPONSE EXPECTED	**ACE** WT/WT	ACE Deletion
Cardiology	**Diuretics:**				
	Hydrochlorothiazide (Microzide®)	◖	✓ NORMAL RESPONSE EXPECTED	**AGTR1** WT/WT	rs5186 AA genotype
Cardiology	**Diuretics:**				
	Spironolactone (Aldactone®)	◖	✓ NORMAL RESPONSE EXPECTED	**ACE** WT/WT	ACE Deletion
Cardiology	**Miscellaneous Cardiovascular Agents:**				
	Ivabradine (Corlanor®)	◖	✓ NORMAL RESPONSE EXPECTED	**CYP3A4** *1A/*1B	Intermediate Metabolizer
Cardiology	**Phosphodiesterase Inhibitors:**				
	Cilostazol (Pletal®)	◖	✓ NORMAL RESPONSE EXPECTED	**CYP3A5** *1A/*3A	Expresser
Cardiology	**Vasodilators:**				
	Hydralazine	●	◆ USE CAUTION due to decreased drug response	**NAT2** *4/*12	Rapid Acetylator
Cardiology	**Vasodilators:**				
	Nitroprusside (Nitropress®)	◖	✓ NORMAL RESPONSE EXPECTED	**ACE** WT/WT	ACE Deletion
Dentistry	**Cholinergic Agonists:**				
	Cevimeline (Evoxac®)	●	✓ NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer
Endocrinology	**Biguanides:**				
	Metformin (Glucophage®)	◖	✓ NORMAL RESPONSE EXPECTED	**ATM** WT/WT	rs11212617 CC genotype

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Endocrinology	**Endocrine Enzyme Inhibitors:**				
	Eliglustat (Cerdelga®)	●	✓ NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer
Endocrinology	**Sulfonylureas:**				
	Chlorpropamide (Diabinese®)	●	✗ CONSIDER ALTERNATIVES	**G6PD** WT/Mediterranean	G6PD Deficiency
	Glimepiride (Amaryl®)	●			
	Glipizide (Glucotrol®)	●			
	Glyburide (Glynase®)	●			
	Tolbutamide	○			
Endocrinology	**Thiazolidinediones:**				
	Pioglitazone (Actos®)	◖	✓ NORMAL RESPONSE EXPECTED	**CYP2C8** *1/*1	Wild Type
Endocrinology	**Thiazolidinediones:**				
	Rosiglitazone (Avandia®)	◖	✓ NORMAL RESPONSE EXPECTED	**CYP2C8** *1/*1	Wild Type
Gastroenterology	**Histamine H2 Antagonists:**				
	Famotidine (Pepcid®)	○	✓ NORMAL DOSE	**CYP2C19** *1/*2	Intermediate Metabolizer
Gastroenterology	**Monoclonal Antibody:**				
	Adalimumab (Humira®)	○	✓ NORMAL RESPONSE EXPECTED	**HFE** WT/c.340+4T>C	rs2071303 C Allele Carrier
Gastroenterology	**Osmotic Laxatives:**				
	Ascorbic Acid (MoviPrep®)	●	! USE CAUTION due to a risk of hemolytic anemia	**G6PD** WT/Mediterranean	G6PD Deficiency
Gastroenterology	**Proton Pump Inhibitors (PPIs):**				
	Dexlansoprazole (Dexilant®)	●	! USE CAUTION due to higher drug plasma levels	**CYP2C19** *1/*2	Intermediate Metabolizer
	Esomeprazole (Nexium®)	●			
	Lansoprazole (Prevacid®)	●			
	Omeprazole (Prilosec®)	●			
	Pantoprazole (Protonix®)	●			
	Rabeprazole (Aciphex®)	●			

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Gynecology	**Hormonal Contraceptives:**				
	Ethinyl Estradiol/Norelgestromin (Ortho Evra®)	●	✓ NORMAL RESPONSE EXPECTED	**F5** WT/WT	Non Factor V Leiden Carrier
Gynecology	**Hormones:**				
	Oral-Contraceptive	◖	✓ NORMAL RESPONSE EXPECTED	**F2** WT/WT	Wild Type
Gynecology	**Mixed 5-HT1A Agonists/5-HT2A Antagonists:**				
	Flibanserin (Addyi®)	●	✓ NORMAL RESPONSE EXPECTED	**CYP2C19** *1/*2	Intermediate Metabolizer
Hematology	**Colony Stimulating Factors:**				
	Eltrombopag (Promacta®)	●	✓ NORMAL RESPONSE EXPECTED	**F5** WT/WT	Non Factor V Leiden Carrier
Immunology	**5-Aminosalicylic Acid Derivatives:**				
	Sulfasalazine (Azulfidine®)	●	! USE CAUTION due to a risk of hemolytic anemia	**G6PD** WT/Mediterranean	G6PD Deficiency
Immunology	**Antigout Agents:**				
	Lesinurad (Zurampic®)	●	✓ NORMAL RESPONSE EXPECTED	**CYP2C9** *1/*1	Normal Metabolizer
Immunology	**Antirheumatic Immunosuppressants:**				
	Methotrexate (Trexall®)	◖	✓ NORMAL RESPONSE EXPECTED	**ITPA** WT/WT	Non-protective Wild Type
Immunology	**Immunosuppressant Agents:**				
	Cyclosporine (Gengraf®) Sirolimus (Rapamune®)	◖ ◖	▲ INCREASE DOSE	**CYP3A5** *1A/*3A	Expresser
Immunology	**Immunosuppressant Agents:**				
	Tacrolimus (Prograf®)	◖	▲ INCREASE DOSE	**CYP3A4** *1A/*1B	Intermediate Metabolizer

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Immunology	**Immunosuppressant Agents:**				
	Tacrolimus (Prograf®)	◖	▲ **INCREASE DOSE** with 1.5 to 2 times recommended starting dose not exceed 0.3mg per kg per day	**CYP3A5** *1A/*3A	Expresser
Immunology	**Immunosuppressive Drugs:**				
	Azathioprine (Imuran®)	●	✓ **NORMAL RESPONSE EXPECTED**	**TPMT** *1/*1	Normal Metabolizer
Immunology	**Systemic Corticosteroids:**				
	Methylprednisolone (Medrol®) Prednisolone (Orapred®) Prednisone (Deltasone®)	◖ ◖ ◖	✓ **NORMAL RESPONSE EXPECTED**	**ABCB1** WT/WT	rs2032582 AA genotype/rs1045642 AA genotype
Immunology	**Urate-Oxidase (Recombinent):**				
	Pegloticase (Krystexxa®)	●	◆ **USE CAUTION** due to the risk of hemolysis and methemoglobinemia	**G6PD** WT/Mediterranean	G6PD Deficiency
Immunology	**Uricosuric Agents:**				
	Probenecid	●	◆ **USE CAUTION** due to the risk of hemolysis and methemoglobinemia	**G6PD** WT/Mediterranean	G6PD Deficiency
Immunology	**Xanthine Oxidase Inhibitors:**				
	Allopurinol (Zyloprim®)	●	✓ **NORMAL RESPONSE EXPECTED**	**HLA-B** WT/WT	Wild Type
Infectious Diseases	**Antifungal Drugs:**				
	Voriconazole (Vfend®)	●	✓ **NORMAL RESPONSE EXPECTED**	**CYP2C19** *1/*2	Intermediate Metabolizer
Infectious Diseases	**Antihepaciviral Drugs:**				
	Boceprevir (Victrelis®) Ledipasvir/Sofosbuvir (Harvoni®) Peginterferon alfa-2b (PegIntron®) Ribavirin (Copegus®) Telaprevir (Incivo®)	● ● ● ◖ ●	◆ **USE CAUTION** due to decreased response and increased likelihood of relapse	**IFNL3** 39738787C>T/39743165T>G	Unfavorable Response Genotype
Infectious Diseases	**Antihepaciviral Drugs:**				
	Boceprevir (Victrelis®) Peginterferon alfa-2b (PegIntron®) Ribavirin (Copegus®) Telaprevir (Incivo®)	○ ◖ ◖ ○	◆ **USE CAUTION** due to increased risk of ribavirin-induced hemolytic anemia	**ITPA** WT/WT	Non-protective Wild Type

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Infectious Diseases	**Antimalarial Drugs:**				
	Chloroquine (Aralen®) Primaquine Phosphate (Primaquine®) Quinine (Qualaquin®)	● ● ●	⚠ USE CAUTION due to high risk for hemolysis	**G6PD** WT/Mediterranean	G6PD Deficiency
Infectious Diseases	**Antiretroviral Drugs:**				
	Efavirenz (Sustiva®) Nevirapine (Viramune®)	● ◖	⚠ USE CAUTION due to higher potential for an increased frequency and severity of drug-associated adverse events	**CYP2B6** G516T/G516T/A785G/A785G	G516T Homozygous/A785G Homozygous
Infectious Diseases	**Antiretroviral Drugs:**				
	Abacavir (Ziagen®)	●	✓ NORMAL RESPONSE EXPECTED	**HLA-B** WT/WT	Wild Type
Infectious Diseases	**Antiretroviral Drugs:**				
	Atazanavir (Reyataz®)	◖	✓ NORMAL RESPONSE EXPECTED	**UGT1A1** *1/*28	Heterozygous *28 Allele Carrier
Infectious Diseases	**Antiretroviral Drugs:**				
	Dolutegravir (Tivicay®)	●	✓ NORMAL RESPONSE EXPECTED	**UGT1A1** *1/*28	Heterozygous *28 Allele Carrier
Infectious Diseases	**Antiretroviral Drugs:**				
	Lamivudine (Epivir®) Lopinavir/Ritonavir (Kaletra®) Zidovudine (Retrovir®)	◖ ◖ ◖	✓ NORMAL RESPONSE EXPECTED	**ABCB1** WT/WT	rs2032582 AA genotype/rs1045642 AA genotype
Infectious Diseases	**Antiretroviral Drugs:**				
	Nelfinavir (Viracept®)	●	✓ NORMAL RESPONSE EXPECTED	**CYP2C19** *1/*2	Intermediate Metabolizer
Infectious Diseases	**Antitubercular Agents:**				
	Ethambutol (Myambutol®) Isoniazid Pyrazinamide (Rifater®) Rifampin (Rifadin®)	◖ ● ● ●	✓ NORMAL RESPONSE EXPECTED	**NAT2** *4/*12	Rapid Acetylator
Infectious Diseases	**Lipopeptides:**				
	Daptomycin (Cubicin®)	◖	✓ NORMAL RESPONSE EXPECTED	**ABCB1** WT/WT	rs2032582 AA genotype/rs1045642 AA genotype

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Infectious Diseases	**Macrolides:**				
	Erythromycin/Sulfisoxazole (Pediazole®)	●	DECREASE DOSE due to a risk of hemolytic anemia	**G6PD** WT/Mediterranean	G6PD Deficiency
Infectious Diseases	**Miscellaneous Antibiotics:**				
	Dapsone Sulfamethoxazole/Trimethoprim (Bactrim®)	● ●	USE CAUTION due to an increased risk of hemolytic adverse reactions	**G6PD** WT/Mediterranean	G6PD Deficiency
Infectious Diseases	**Miscellaneous Antibiotics:**				
	Nalidixic Acid (Neggram®) Nitrofurantoin (Macrobid®)	● ●	USE CAUTION due to an association with hemolytic anemia	**G6PD** WT/Mediterranean	G6PD Deficiency
Infectious Diseases	**Topical Antibiotics:**				
	Mafenide (Sulfamylon®)	●	CONSIDER ALTERNATIVES due to reported fatal ADR cases	**G6PD** WT/Mediterranean	G6PD Deficiency
Neurology	**Acetylcholinesterase Inhibitors:**				
	Donepezil (Aricept®)	●	USE CAUTION due to possible increased ADRs caused by decreased drug metabolism	**CYP2D6** *4/*10	Intermediate Metabolizer
Neurology	**Acetylcholinesterase Inhibitors:**				
	Galantamine (Razadyne®)	●	NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer
Neurology	**Anticonvulsant Drugs:**				
	Brivaracetam (Briviact®)	●	USE CAUTION due to possible increased ADRs	**CYP2C19** *1/*2	Intermediate Metabolizer
Neurology	**Anticonvulsant Drugs:**				
	Carbamazepine (Tegretol®) Lamotrigine (Lamictal®) Oxcarbazepine (Trileptal®) Phenytoin (Dilantin®) Topiramate (Topamax®)	◖ ◖ ◖ ◖ ◖	NORMAL RESPONSE EXPECTED	**SCN2A** WT/WT	rs2304016 non-GG genotype

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Neurology	**Anticonvulsant Drugs:**				
	Carbamazepine (Tegretol®) Phenytoin (Dilantin®)	● ●	✓ NORMAL RESPONSE EXPECTED	**HLA-B** WT/WT	Wild Type
Neurology	**Anticonvulsant Drugs:**				
	Clobazam (Onfi®)	●	✓ NORMAL RESPONSE EXPECTED	**CYP2C19** *1/*2	Intermediate Metabolizer
Neurology	**Anticonvulsant Drugs:**				
	Phenobarbital	◖	✓ NORMAL RESPONSE EXPECTED	**ABCB1** WT/WT	rs2032582 AA genotype/rs1045642 AA genotype
Neurology	**Anticonvulsant Drugs:**				
	Valproic Acid (Depakote®)	◖	✓ NORMAL RESPONSE EXPECTED	**ANKK1** WT/c.2137G>A	A1 Heterozygous
Neurology	**Antimigraine Agents:**				
	Eletriptan (Relpax®)	○	✓ NORMAL RESPONSE EXPECTED	**CYP3A4** *1A/*1B	Intermediate Metabolizer
Neurology	**Antimigraine Agents:**				
	Zolmitriptan (Zomig®)	○	✓ NORMAL RESPONSE EXPECTED	**CYP1A2** *1A/*1F	Normal Metabolizer
Neurology	**Central Monoamine-Depleting Agents:**				
	Tetrabenazine (Xenazine®)	●	✓ NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer
Neurology	**COMT Inhibitors:**				
	Entacapone (Comtan®)	◖	✓ NORMAL RESPONSE EXPECTED	**COMT** WT/WT	Non MET Homozygous
Neurology	**NMDA Receptor Antagonists:**				
	Dextromethorphan/Quinidine (Nuedexta®)	●	✓ NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Oncology	**Alkylating Agents:**				
	Cyclophosphamide (Cytoxan®)	◖	USE CAUTION due to worse outcome including overall survival and progression-free survival	**NQO1** c.559C>T/c.559C>T	rs1800566 AA genotype
Oncology	**Anthracyclines:**				
	Doxorubicin (Doxil®)	◖	USE CAUTION due to worse outcome including overall survival and progression-free survival	**NQO1** c.559C>T/c.559C>T	rs1800566 AA genotype
Oncology	**Anthracyclines:**				
	Epirubicin (Ellence®)	◖	USE CAUTION due to worse outcome including overall survival and progression-free survival	**NQO1** c.559C>T/c.559C>T	rs1800566 AA genotype
Oncology	**Antiemetics:**				
	Dexamethasone (Decadron®)	◖	NORMAL RESPONSE EXPECTED	**ABCB1** WT/WT	rs2032582 AA genotype/rs1045642 AA genotype
Oncology	**Antiemetics:**				
	Dronabinol (Marinol®)	●	NORMAL RESPONSE EXPECTED	**CYP2C9** *1/*1	Normal Metabolizer
Oncology	**Antiemetics (Selective 5-HT3 Receptor Antagonist):**				
	Dolasetron (Anzemet®) Granisetron (Sancuso®)	◖ ◖	NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer
Oncology	**Antiemetics (Selective 5-HT3 Receptor Antagonist):**				
	Dolasetron (Anzemet®) Granisetron (Sancuso®)	◖ ◖	NORMAL RESPONSE EXPECTED	**NOS1AP** WT/WT	rs10494366 GG genotype/rs10800397 C Allele Carrier/rs10919035 C Allele Carrier
Oncology	**Antiemetics (Selective 5-HT3 Receptor Antagonist):**				
	Ondansetron (Zofran®)	◖	NORMAL RESPONSE EXPECTED	**ABCB1** WT/WT	rs2032582 AA genotype/rs1045642 AA genotype
Oncology	**Antiemetics (Selective 5-HT3 Receptor Antagonist):**				
	Ondansetron (Zofran®)	◖	NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Oncology	**Antiemetics (Selective 5-HT3 Receptor Antagonist):**				
	Palonosetron (Aloxi®)	●	✓ NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer
Oncology	**Antimetabolites (Purine Analog):**				
	Mercaptopurine (Purinethol®) Thioguanine (Tabloid®)	● ●	✓ NORMAL RESPONSE EXPECTED	**TPMT** *1/*1	Normal Metabolizer
Oncology	**Antimetabolites (Pyrimidine Analog):**				
	Fluorouracil (Carac®)	◖	! USE CAUTION due to increased risk of diarrhea	**ABCB1** WT/WT	rs2032582 AA genotype/rs1045642 AA genotype
Oncology	**Antimetabolites (Pyrimidine Analog):**				
	Fluorouracil (Carac®)	◖	! USE CAUTION due to an increased risk for nephrotoxicity, decreased survival and a poorer response	**ERCC1** WT/WT	rs3212986 C Allele Carrier/rs11615 AA genotype/rs735482 AA genotype
Oncology	**Antimetabolites (Pyrimidine Analog):**				
	Fluorouracil (Carac®)	◖	! USE CAUTION due to a highly increased risk of toxicity and poorer treatment outcome	**GSTP1** WT/WT	rs1695 AA genotype
Oncology	**Antimetabolites (Pyrimidine Analog):**				
	Fluorouracil (Carac®)	◖	! USE CAUTION due to worse outcome including overall survival and progression-free survival	**NQO1** c.559C>T/c.559C>T	rs1800566 AA genotype
Oncology	**Antimetabolites (Pyrimidine Analog):**				
	Fluorouracil (Carac®)	◖	! USE CAUTION due to decreased survival and response	**XRCC1** WT/WT	rs25487 T Allele Carrier
Oncology	**Antimetabolites (Pyrimidine Analog):**				
	Capecitabine (Xeloda®) Pyrimidinedione (Tegafur-Uracil®)	● ◖	✓ NORMAL RESPONSE EXPECTED	**DPYD** *5/*9A/c.496A>G/IVS10-15T>C	Normal Metabolizer
Oncology	**Antimetabolites (Pyrimidine Analog):**				
	Cytarabine (Depocyt®)	◖	✓ NORMAL RESPONSE EXPECTED	**CDA** WT/WT	rs532545 C Allele

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Oncology	**BCR-ABL Tyrosine Kinase Inhibitors:**				
	Nilotinib (Tasigna®) Pazopanib (Votrient®)	●	✓ **NORMAL RESPONSE EXPECTED**	**UGT1A1** *1/*28	Heterozygous *28 Allele Carrier
Oncology	**BRAF Kinase Inhibitors:**				
	Dabrafenib (Tafinlar®)	●	! **USE CAUTION** by closely observing patients with G6PD deficiency for signs of hemolytic anemia	**G6PD** WT/Mediterranean	G6PD Deficiency
Oncology	**Chemotherapy Modulating Agents:**				
	Leucovorin (Wellcovorin®)	◖	! **USE CAUTION** due to an increased risk for nephrotoxicity, decreased survival and a poorer response	**ERCC1** WT/WT	rs3212986 C Allele Carrier/rs11615 AA genotype/rs735482 AA genotype
Oncology	**Chemotherapy Modulating Agents:**				
	Leucovorin (Wellcovorin®)	○	! **USE CAUTION** due to a highly increased risk of toxicity and poorer treatment outcome	**GSTP1** WT/WT	rs1695 AA genotype
Oncology	**Chemotherapy Modulating Agents:**				
	Leucovorin (Wellcovorin®)	○	! **USE CAUTION** due to decreased survival and response	**XRCC1** WT/WT	rs25487 T Allele Carrier
Oncology	**EGFR Tyrosine Kinase Inhibitors:**				
	Erlotinib (Tarceva®)	◖	✓ **NORMAL RESPONSE EXPECTED**	**UGT1A1** *1/*28	Heterozygous *28 Allele Carrier
Oncology	**EGFR Tyrosine Kinase Inhibitors:**				
	Gefitinib (Iressa®)	◖	✓ **NORMAL RESPONSE EXPECTED**	**CYP3A4** *1A/*1B	Intermediate Metabolizer
Oncology	**EGFR Tyrosine Kinase Inhibitors:**				
	Ruxolitinib (Jakavi®)	◖	✓ **NORMAL RESPONSE EXPECTED**	**CYP3A4** *1A/*1B	Intermediate Metabolizer
Oncology	**Folate Antimetabolites:**				
	Methotrexate (Trexall®)	◖	! **USE CAUTION** due to increased risk of toxicity caused by increased drug concentration	**ABCB1** WT/WT	rs2032582 AA genotype/rs1045642 AA genotype

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Oncology	**Folate Antimetabolites:**				
	Pemetrexed (Alimta®)	◖	✓ NORMAL RESPONSE EXPECTED	**MTHFR** WT/WT	Wild Type
Oncology	**Histone Deacetylase (HDAC) Inhibitors:**				
	Belinostat (Beleodaq®)	●	✓ NORMAL RESPONSE EXPECTED	**UGT1A1** *1/*28	Heterozygous *28 Allele Carrier
Oncology	**Immunomodulators:**				
	Thalidomide (Thalomid®)	◖	! USE CAUTION due to decreased overall survival	**ERCC1** WT/WT	rs3212986 C Allele Carrier/rs11615 AA genotype/rs735482 AA genotype
Oncology	**Platinum Analog:**				
	Carboplatin (Paraplatin®) Cisplatin (Platinol®) Oxaliplatin (Eloxatin®)	◖ ◖ ◖	! USE CAUTION due to an increased risk for nephrotoxicity, decreased survival and a poorer response	**ERCC1** WT/WT	rs3212986 C Allele Carrier/rs11615 AA genotype/rs735482 AA genotype
Oncology	**Platinum Analog:**				
	Carboplatin (Paraplatin®) Cisplatin (Platinol®) Oxaliplatin (Eloxatin®)	◖ ◖ ◖	! USE CAUTION due to a highly increased risk of toxicity and poorer treatment outcome	**GSTP1** WT/WT	rs1695 AA genotype
Oncology	**Platinum Analog:**				
	Carboplatin (Paraplatin®) Cisplatin (Platinol®) Oxaliplatin (Eloxatin®)	◖ ◖ ◖	! USE CAUTION due to decreased survival and response	**XRCC1** WT/WT	rs25487 T Allele Carrier
Oncology	**Platinum Analog:**				
	Cisplatin (Platinol®) Oxaliplatin (Eloxatin®)	◖ ◖	! USE CAUTION due to worse outcome including overall survival and progression-free survival	**NQO1** c.559C>T/c.559C>T	rs1800566 AA genotype
Oncology	**Platinum Analog:**				
	Cisplatin (Platinol®)	◖	! USE CAUTION due to increased risk for nephrotoxicity	**ERCC1** WT/WT	rs3212986 C Allele Carrier/rs11615 AA genotype/rs735482 AA genotype

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Oncology	**Selective Estrogen Receptor Modulators (SERMs):**				
	Tamoxifen (Soltamox®)	◖	**CONSIDER ALTERNATIVES** like aromatase inhibitor for postmenopausal women due to increased risk for relapse of breast cancer	**CYP2D6** *4/*10	Intermediate Metabolizer
Oncology	**Taxane Derivatives:**				
	Docetaxel (Taxotere®)	◖	**USE CAUTION** due to increased risk for nephrotoxicity	**ERCC1** WT/WT	rs3212986 C Allele Carrier/rs11615 AA genotype/rs735482 AA genotype
Oncology	**Taxane Derivatives:**				
	Paclitaxel (Abraxane®)	◖	**USE CAUTION** due to increased risk for nephrotoxicity	**ERCC1** WT/WT	rs3212986 C Allele Carrier/rs11615 AA genotype/rs735482 AA genotype
Oncology	**Taxane Derivatives:**				
	Cabazitaxel (Jevtana®)	◖	**NORMAL RESPONSE EXPECTED**	**CYP3A4** *1A/*1B	Intermediate Metabolizer
Oncology	**Topoisomerase I Inhibitors:**				
	Irinotecan (Camptosar®)	●	**NORMAL RESPONSE EXPECTED**	**UGT1A1** *1/*28	Heterozygous *28 Allele Carrier
Oncology	**Topoisomerase II Inhibitors:**				
	Idarubicin (Idamycin®)	◖	**NORMAL RESPONSE EXPECTED**	**SLCO1B1** *1/*1	Normal Activity
Oncology	**Urate-Oxidases (Recombinant):**				
	Rasburicase (Elitek®)	●	**CONSIDER ALTERNATIVES** include allopurinol	**G6PD** WT/Mediterranean	G6PD Deficiency
Oncology	**VEGF Tyrosine Kinase Inhibitors:**				
	Sorafenib (NexAvar®)	◖	**USE CAUTION** due to increased risk of hyperbilirubinemia and treatment interruption	**UGT1A1** *1/*28	Heterozygous *28 Allele Carrier

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Oncology	**VEGF Tyrosine Kinase Inhibitors:**				
	Sunitinib (Sutent®)	◖	✓ NORMAL RESPONSE EXPECTED	**CYP3A4** *1A/*1B	Intermediate Metabolizer
Oncology	**Vinca Alkaloids:**				
	Vincristine (Marqibo®)	◖	✓ NORMAL RESPONSE EXPECTED	**ABCB1** WT/WT	rs2032582 AA genotype/rs1045642 AA genotype
Osteoporosis	**Selective Estrogen Receptor Modulators (SERMs):**				
	Raloxifene (Evista®)	◖	! USE CAUTION due to decreased hip bone mineral density	**UGT1A1** *1/*28	Heterozygous *28 Allele Carrier
Pain Management	**Alpha-2 Adrenergic Agonists:**				
	Tizanidine (Zanaflex®)	○	✓ NORMAL RESPONSE EXPECTED	**CYP1A2** *1A/*1F	Normal Metabolizer
Pain Management	**Nonsteroidal Antiinflammatory Drugs (NSAIDs):**				
	Celecoxib (Celebrex®)	●	✓ NORMAL RESPONSE EXPECTED	**CYP2C9** *1/*1	Normal Metabolizer
	Diclofenac (Voltaren®)	◖			
	Meloxicam (Mobic®)	◖			
Pain Management	**Nonsteroidal Antiinflammatory Drugs (NSAIDs):**				
	Ibuprofen (Advil®)	○	✓ NORMAL RESPONSE EXPECTED	**CYP2C9** *1/*1	Normal Metabolizer
	Naproxen (Aleve®)	○			
Pain Management	**Nonsteroidal Antiinflammatory Drugs (NSAIDs):**				
	Piroxicam (Feldene®)	●	✓ NORMAL RESPONSE EXPECTED	**CYP2C9** *1/*1	Normal Metabolizer
Pain Management	**Opioids:**				
	Codeine (Codeine®)	◖	✗ CONSIDER ALTERNATIVES if no response	**CYP2D6** *4/*10	Intermediate Metabolizer
	Codeine/Acetaminophen (Tylenol #3 & #4®)	◖			
	Hydrocodone/Acetaminophen (Vicodin®)	◖			
	Oxycodone (Oxycontin®)	◖			

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Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Pain Management	**Opioids:**				
	Tramadol Hydrochloride/Acetaminophen (Ultracet®) Tramadol (Ultram®)	● ●	CONSIDER ALTERNATIVES (not oxycodone, codeine) OR INCREASE DOSE	**CYP2D6** *4/*10	Intermediate Metabolizer
Pain Management	**Opioids:**				
	Methadone (Methadose®)	◖	DECREASE DOSE	**CYP2B6** G516T/G516T/A785G/A785G	G516T Homozygous/A785G Homozygous
Pain Management	**Opioids:**				
	Buprenorphine (Subutex®) Fentanyl (Duragesic®) Sufentanil (Sufenta®)	○ ○ ○	DECREASE DOSE OR USE CAUTION due to the risk of increased exposure to the drug leading to adverse events	**CYP3A4** *1A/*1B	Intermediate Metabolizer
Pain Management	**Opioids:**				
	Alfentanil (Alfenta®) Hydromorphone (Dilaudid®) Morphine (MS Contin®)	◖ ○ ◖	NORMAL RESPONSE EXPECTED	**OPRM1** WT/WT	rs1799971 A Allele Carrier/rs510679 TT genotype
Pain Management	**Skeletal Muscle Relaxants:**				
	Carisoprodol (Soma®)	◖	NORMAL RESPONSE EXPECTED	**CYP2C19** *1/*2	Intermediate Metabolizer
Pain Management	**Skeletal Muscle Relaxants:**				
	Cyclobenzaprine (Flexeril®)	○	NORMAL RESPONSE EXPECTED	**CYP1A2** *1A/*1F	Normal Metabolizer
Psychiatry	**Aldehyde Dehydrogenase Inhibitors:**				
	Disulfiram (Antabuse®)	◖	NORMAL DOSE may have an increased likelihood of response	**ANKK1** WT/c.2137G>A	A1 Heterozygous

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Psychiatry	**Alpha-2 Antagonists:**				
	Mirtazapine (Remeron®)	◖	⚠ USE CAUTION due to possible increased ADRs	**CYP2D6** *4/*10	Intermediate Metabolizer
Psychiatry	**Anti-Anxiety Agents:**				
	Buspirone (Buspar®)	○	✓ NORMAL RESPONSE EXPECTED	**HTR1A** WT/WT	rs6295 CC genotype/rs1800044 C Allele Carrier
Psychiatry	**Antimanic Agents:**				
	Lithium (Lithobid®)	◖	⚠ USE CAUTION due to possible less drug response	**ABCB1** WT/WT	rs2032582 AA genotype/rs1045642 AA genotype
Psychiatry	**Antipsychotics:**				
	Risperidone (Risperdal®)	●	✖ CONSIDER ALTERNATIVES (e.g., quetiapine, olanzapine, clozapine)	**CYP2D6** *4/*10	Intermediate Metabolizer
Psychiatry	**Antipsychotics:**				
	Thioridazine (Mellaril®)	●	✖ CONSIDER ALTERNATIVES	**CYP2D6** *4/*10	Intermediate Metabolizer
Psychiatry	**Antipsychotics:**				
	Chlorpromazine Fluphenazine	◖ ◖	⚠ USE CAUTION due to possible increased QT interval	**CYP1A2** *1A/*1F	Normal Metabolizer
Psychiatry	**Antipsychotics:**				
	Clozapine (Clozaril®)	◖	⚠ USE CAUTION due to increased risk of side effects including hyperprolactinemia and weight gain	**ANKK1** WT/c.2137G>A	A1 Heterozygous
Psychiatry	**Antipsychotics:**				
	Clozapine (Clozaril®)	◖	⚠ USE CAUTION due to increased risk of developing metabolic syndrome	**HTR2C** WT/WT	rs1414334 C Allele Carrier

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Psychiatry	**Antipsychotics:**				
	Olanzapine (Zyprexa®) Quetiapine (Seroquel®)	◖ ◖	⚠ USE CAUTION due to increased risk of side effects	**SLC6A4** LA/LA	HTTLPR Long Form
Psychiatry	**Antipsychotics:**				
	Olanzapine (Zyprexa®)	◖	⚠ USE CAUTION due to increased risk of side effects including hyperprolactinemia and weight gain	**ANKK1** WT/c.2137G>A	A1 Heterozygous
Psychiatry	**Antipsychotics:**				
	Olanzapine (Zyprexa®)	◖	⚠ USE CAUTION due to increased risk of developing metabolic syndrome	**HTR2C** WT/WT	rs1414334 C Allele Carrier
Psychiatry	**Antipsychotics:**				
	Aripiprazole (Abilify®) Brexpiprazole (Rexulti®) Iloperidone (Fanapt®) Pimozide (Orap®)	● ● ● ●	✓ NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer
Psychiatry	**Antipsychotics:**				
	Aripiprazole (Abilify®)	◖	✓ NORMAL RESPONSE EXPECTED	**CYP3A4** *1A/*1B	Intermediate Metabolizer
Psychiatry	**Antipsychotics:**				
	Haloperidol (Haldol®)	◖	✓ NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer
Psychiatry	**Antipsychotics:**				
	Perphenazine	●	✓ NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer
Psychiatry	**Benzodiazepines:**				
	Diazepam (Valium®)	●	⚠ USE CAUTION due to possible increased ADRs	**CYP2C19** *1/*2	Intermediate Metabolizer
Psychiatry	**Benzodiazepines:**				
	Alprazolam (Xanax®)	○	✓ NORMAL RESPONSE EXPECTED	**CYP3A4** *1A/*1B	Intermediate Metabolizer

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Psychiatry	**Benzodiazepines:**				
	Lorazepam (Ativan®) Oxazepam (Serax®)	◖ ◖	✓ NORMAL RESPONSE EXPECTED	**UGT2B15** *1/*2	rs1902023 non-AA genotype
Psychiatry	**Benzodiazepines:**				
	Midazolam (Versed®)	◖	✓ NORMAL RESPONSE EXPECTED	**CYP3A5** *1A/*3A	Expresser
Psychiatry	**CNS Stimulants (ADHD):**				
	Amphetamine/Dextroamphetamine (Adderall®) Dextroamphetamine (Dexedrine®) Methylphenidate (Ritalin®)	◖ ◖ ◖	! USE CAUTION due to increased severity of social withdrawal	**DRD1** WT/WT	rs4532 CC genotype
Psychiatry	**CNS Stimulants (ADHD):**				
	Dexmethylphenidate (Focalin®) Lisdexamfetamine (Vyvanse®)	◖ ○	✓ NORMAL RESPONSE EXPECTED	**COMT** WT/WT	Non MET Homozygous
Psychiatry	**CNS Stimulants (ADHD):**				
	Methamphetamine (Desoxyn®)	◖	✓ NORMAL RESPONSE EXPECTED	**FAAH** WT/WT	rs324420 CC genotype
Psychiatry	**Dopamine/Norepinephrine-Reuptake Inhibitors:**				
	Bupropion (Wellbutrin®)	◖	! USE CAUTION due to reduced response and increased risk of side effects	**CYP2B6** G516T/G516T/A785G/A785G	G516T Homozygous/A785G Homozygous
Psychiatry	**Dopamine/Norepinephrine-Reuptake Inhibitors:**				
	Bupropion (Wellbutrin®)	◖	! USE CAUTION due to reduced response and increased risk of side effects	**CYP2C19** *1/*2	Intermediate Metabolizer
Psychiatry	**Opioids Antagonists:**				
	Naloxone (Evzio®) Naltrexone (Revia®)	◖ ◖	✓ NORMAL RESPONSE EXPECTED	**OPRM1** WT/WT	rs1799971 A Allele Carrier/rs510679 TT genotype
Psychiatry	**Other Stimulants:**				
	Cannabinoids	◖	! USE CAUTION due to increased risk of tetrahydrocannabinol (THC) dependence	**FAAH** WT/WT	rs324420 CC genotype

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Psychiatry	**Other Stimulants:**				
	Cocaine	◖	✓ NORMAL RESPONSE EXPECTED	**CNR1** c.*3475A>G/c.*3475A>G	rs806368 non-TT genotype
Psychiatry	**Selective Serotonin Reuptake Inhibitors (SSRIs):**				
	Citalopram (Celexa®)	◖	! USE CAUTION due to reduced response	**GRIK4** WT/WT	rs1954787 T Allele Carrier
Psychiatry	**Selective Serotonin Reuptake Inhibitors (SSRIs):**				
	Fluoxetine (Prozac®)	●	! USE CAUTION due to elevated risk for drug overdose resulting in adverse events and drug interaction	**CYP2D6** *4/*10	Intermediate Metabolizer
Psychiatry	**Selective Serotonin Reuptake Inhibitors (SSRIs):**				
	Fluvoxamine (Luvox®) Paroxetine (Paxil®) Sertraline (Zoloft®)	◖ ◖ ◖	! USE CAUTION due to reduced response	**HTR1A** WT/WT	rs6295 CC genotype/rs1800044 C Allele Carrier
Psychiatry	**Selective Serotonin Reuptake Inhibitors (SSRIs):**				
	Sertraline (Zoloft®)	◖	! USE CAUTION with high alert to adverse drug events	**CYP2C19** *1/*2	Intermediate Metabolizer
Psychiatry	**Selective Serotonin Reuptake Inhibitors (SSRIs):**				
	Escitalopram (Lexapro®)	●	✓ NORMAL RESPONSE EXPECTED	**CYP2C19** *1/*2	Intermediate Metabolizer
Psychiatry	**Selective Serotonin Reuptake Inhibitors (SSRIs):**				
	Escitalopram (Lexapro®)	◖	✓ NORMAL RESPONSE EXPECTED	**SLC6A4** LA/LA	HTTLPR Long Form
Psychiatry	**Selective Serotonin Reuptake Inhibitors (SSRIs):**				
	Vilazodone (Viibryd®)	○	✓ NORMAL RESPONSE EXPECTED	**CYP3A4** *1A/*1B	Intermediate Metabolizer
Psychiatry	**Selective Serotonin Reuptake Inhibitors (SSRIs):**				
	Vortioxetine (Trintellix®)	●	✓ NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Psychiatry	**Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs):**				
	Venlafaxine (Effexor®)	●	✖ **CONSIDER ALTERNATIVES** (e.g., citalopram, sertraline)	**CYP2D6** *4/*10	Intermediate Metabolizer
Psychiatry	**Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs):**				
	Milnacipran (Savella®)	◖	⚠ **USE CAUTION** due to reduced response	**ADRA2A** WT/c.-217G>A	rs1800544 GG genotype/rs1800545 GA genotype
Psychiatry	**Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs):**				
	Milnacipran (Savella®)	◖	⚠ **USE CAUTION** due to reduced response	**HTR1A** WT/WT	rs6295 CC genotype/rs1800044 C Allele Carrier
Psychiatry	**Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs):**				
	Atomoxetine (Strattera®)	●	✔ **NORMAL RESPONSE EXPECTED**	**CYP2D6** *4/*10	Intermediate Metabolizer
Psychiatry	**Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs):**				
	Duloxetine (Cymbalta®)	○	✔ **NORMAL RESPONSE EXPECTED**	**CYP1A2** *1A/*1F	Normal Metabolizer
Psychiatry	**Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs):**				
	Levomilnacipran (Fetzima®)	○	✔ **NORMAL RESPONSE EXPECTED**	**CYP3A4** *1A/*1B	Intermediate Metabolizer
Psychiatry	**Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs):**				
	Reboxetine (Edronax®)	○	✔ **NORMAL RESPONSE EXPECTED**	**CYP3A4** *1A/*1B	Intermediate Metabolizer
Psychiatry	**Serotonin Reuptake Inhibitors/Antagonists:**				
	Trazodone (Desyrel®)	○	✔ **NORMAL RESPONSE EXPECTED**	**CYP3A4** *1A/*1B	Intermediate Metabolizer

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Psychiatry	**Tetracyclic Antidepressants:**				
	Maprotiline	◖	▼ DECREASE DOSE	**CYP2D6** *4/*10	Intermediate Metabolizer
Psychiatry	**Tricyclic Antidepressants:**				
	Amitriptyline (Elavil®)	●	▼ DECREASE DOSE	**CYP2D6** *4/*10	Intermediate Metabolizer
	Clomipramine (Anafranil®)	●	by 25%		
	Doxepin (Silenor®)	●			
	Imipramine (Tofranil®)	●			
	Protriptyline (Vivactil®)	●			
	Trimipramine (Surmontil®)	●			
Psychiatry	**Tricyclic Antidepressants:**				
	Desipramine (Norpramin®)	●	▼ DECREASE DOSE	**CYP2D6** *4/*10	Intermediate Metabolizer
	Nortriptyline (Pamelor®)	●	by 25%		
Rheumatology	**Nonsteroidal Antiinflammatory Drugs (NSAIDs):**				
	Flurbiprofen (Ansaid®)	●	✓ NORMAL RESPONSE EXPECTED	**CYP2C9** *1/*1	Normal Metabolizer
Smoking Cessation	**Smoking Cessation Aids:**				
	Bupropion (Zyban®)	◖	! USE CAUTION due to reduced effectiveness	**ANKK1** WT/c.2137G>A	A1 Heterozygous
Smoking Cessation	**Smoking Cessation Aids:**				
	Nicotine (Nicoderm®)	◖	✓ NORMAL RESPONSE EXPECTED	**COMT** WT/WT	Non MET Homozygous
Supplements	**Vitamins:**				
	Folic Acid	◖	✓ NORMAL RESPONSE EXPECTED	**MTHFR** WT/WT	Wild Type
Toxicology	**Antidotes:**				
	Sodium Nitrite	●	✗ CONSIDER ALTERNATIVES	**G6PD** WT/Mediterranean	G6PD Deficiency

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Toxicology	**Antidotes:**				
	Ethanol	◖	USE CAUTION due to increased risk for alcoholism	**ANKK1** WT/c.2137G>A	A1 Heterozygous
Toxicology	**Antidotes:**				
	Methylene Blue (Provayblue®)	●	USE CAUTION due to risk of hemolytic anemia	**G6PD** WT/Mediterranean	G6PD Deficiency
Urology	**Alpha 1 Blockers:**				
	Dutasteride/Tamsulosin (Jalyn®) Tamsulosin (Flomax®)	● ●	NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer
Urology	**Alpha 1 Blockers:**				
	Silodosin (Rapaflo®)	○	NORMAL RESPONSE EXPECTED	**CYP3A4** *1A/*1B	Intermediate Metabolizer
Urology	**Anticholinergic Agents:**				
	Darifenacin (Enablex®) Fesoterodine (Toviaz®)	● ●	NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer
Urology	**Anticholinergic Agents:**				
	Tolterodine (Detrol®)	●	NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer

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Patient PGxPsych™ Genotype and Phenotype Results for Smith, John

Gene	Genotype	Phenotype
ABCB1	WT/WT	rs2032582 AA genotype/rs1045642 AA genotype
ACE	WT/WT	ACE Deletion
ADRA2A	WT/c.-217G>A	rs1800544 GG genotype/rs1800545 GA genotype
AGTR1	WT/WT	rs5186 AA genotype
ANKK1	WT/c.2137G>A	A1 Heterozygous
APOB	c.8216C>T/c.8216C>T	rs676210 AA Genotype
APOE	WT/WT	Non E2 Carrier
ATM	WT/WT	rs11212617 CC genotype
CDA	WT/WT	rs532545 C Allele
CES1	WT/WT	rs71647871 C Allele
CNR1	c.*3475A>G/c.*3475A>G	rs806368 non-TT genotype
COMT	WT/WT	Non MET Homozygous
CYP1A2	*1A/*1F	Normal Metabolizer
CYP2B6	G516T/G516T/A785G/A785G	G516T Homozygous/A785G Homozygous
CYP2C19	*1/*2	Intermediate Metabolizer
CYP2C8	*1/*1	Wild Type
CYP2C9	*1/*1	Normal Metabolizer
CYP2D6	*4/*10	Intermediate Metabolizer
CYP3A4	*1A/*1B	Intermediate Metabolizer
CYP3A5	*1A/*3A	Expresser
CYP4F2	*1/*1	Normal Metabolizer
DPYD	*5/*9A/c.496A>G/IVS10-15T>C	Normal Metabolizer
DRD1	WT/WT	rs4532 CC genotype
DRD2	WT/WT	rs1799978 TT genotype
ERCC1	WT/WT	rs3212986 C Allele Carrier/rs11615 AA genotype/rs735482 AA genotype

Gene	Genotype	Phenotype
F2	WT/WT	Wild Type
F5	WT/WT	Non Factor V Leiden Carrier
FAAH	WT/WT	rs324420 CC genotype
G6PD	WT/Mediterranean	G6PD Deficiency
GRIK4	WT/WT	rs1954787 T Allele Carrier
GSTP1	WT/WT	rs1695 AA genotype
HFE	WT/c.340+4T>C	rs2071303 C Allele Carrier
HLA-B	WT/WT	Wild Type
HTR1A	WT/WT	rs6295 CC genotype/rs1800044 C Allele Carrier
HTR2A	WT/WT	rs7997012 non-GG genotype
HTR2C	WT/WT	rs1414334 C Allele Carrier
IFNL3	39738787C>T/39743165T>G	Unfavorable Response Genotype
ITPA	WT/WT	Non-protective Wild Type
KIF6	WT/WT	rs20455 AA genotype
LDLR	c.1773C>T/c.1773C>T	rs688 TT Genotype
MTHFR	WT/WT	Wild Type
NAT2	*4/*12	Rapid Acetylator
NOS1AP	WT/WT	rs10494366 GG genotype/rs10800397 C Allele Carrier/rs10919035 C Allele Carrier
NQO1	c.559C>T/c.559C>T	rs1800566 AA genotype
OPRM1	WT/WT	rs1799971 A Allele Carrier/rs510679 TT genotype
SCN2A	WT/WT	rs2304016 non-GG genotype
SLC6A4	LA/LA	HTTLPR Long Form
SLCO1B1	*1/*1	Normal Activity
TPMT	*1/*1	Normal Metabolizer
UGT1A1	*1/*28	Heterozygous *28 Allele Carrier
UGT2B15	*1/*2	rs1902023 non-AA genotype
VKORC1	WT/-1639G>A	rs9923231 A Allele Carrier
XRCC1	WT/WT	rs25487 T Allele Carrier

Assay Methodology and Limitations for PGxPsych™ Panel:

Pharmacogenomics testing to assess how a patient may respond to prescribed drugs was performed by massively parallel Next Generation Sequencing (NGS). PGxPsych™ was developed, and assessed for accuracy and precision by Admera Health, South Plainfield NJ. The sensitivity and specificity of this test is 100% and 100% respectively. PGxPsych™ has not been cleared or approved by the U.S. Food and Drug Administration (FDA) but the FDA has determined that such clearance or approval is not necessary. The PGxPsych™ test is used for clinical purposes. It should not be regarded as investigational or for research. Drug interaction information is based upon data available in scientific literature and prescribing information for the most commonly prescribed drugs. This laboratory is certified under the Clinical Laboratory Improvement Amendments (CLIA) as qualified to perform high complexity clinical laboratory testing. The DNA testing is not a substitute for clinical monitoring.

*The panel includes 53 genes and 214 variants based on the recommendations of the Clinical Pharmacogenetics Implementation Consortium (CPIC) and Dutch Pharmacogenetics Working Group (DPWG) and the FDA's work group guidance. The following genetic variants may be detected in the assay: ABCB1 c.3435T>C, c.2677T>A(G); ACE ACE Insertion; ADRA2A c.1252G>C, c.-217G>A; AGTR1 c.*86A>C; ANKK1 A1; APOB c.8216C>T; APOE Apoå2; ATM c.175-5285G>T; CDA c.-451C>T; CES1 c.428G>A; CNR1 c.*3475A>G; COMT c.472G>A; CYP1A2 *1A, *1C, *1F, *1K, *3, *4, *6, *7; CYP2B6 A785G, G516T, T983C; CYP2C19 *1, *2, *3, *4, *5, *6, *7, *8, *9, *10, *12, *17; CYP2C8 *3; CYP2C9 *1, *2, *3, *4, *5, *6, *8, *9, *11, *12, *13, *14, *15, *16; CYP2D6 *1, *2, *3, *4, *5, *6, *7, *8, *9, *10, *11, *12, *14, *17, *19, *20, *21, *29, *35, *38, *40, *41, *44, *1XN, *2XN, *4XN, *10XN, *17XN, *29xN, *35xN, *41XN; CYP3A4 *1A, *1B, *2, *3, *12, *17; CYP3A5 *1A, *2, *3A, *3B, *6, *7, *8, *9; CYP4F2 *1, *3; DPYD *1, *2A, *3, *4, *5, *6, *7, *8, *9A, *9B, *10, *11, *12, *13, c.496A>G, IVS10-15T>C, c.1845G>T, c.2846A>T; DRD1 c.-48G>A; DRD2 c.-585A>G; ERCC1 c.*197G>T, c.354T>C, c.*931T>G; F2 G20210A; F5 c.1601G>A; FAAH c.385C>A; G6PD A, A-202A_376G, A-376G_968C, Alhambra, Andalus, Beverly Hills, Canton, Cassano, Chatham, Chinese-3, Chinese-4, Coimbra, Cosenza, Fushan, Guadalajara, Ilesha, Iowa, Kaiping, Kalyan, Lagosanto, Mahidol, Mediterranean, Metaponto, Minnesota, Mt. Sinai, Nara, Nashville, Olomouc, Pawnee, Plymouth, Praba, Puetro Limon, Santamaria, Santiago, Santiago de Cuba, Sao Boria, Shinshu, Sibari, Telti, Tomah, Ube, Union, Viangchan, West Virginia; GRIK4 c.83-10039T>C; GSTP1 c.313A>G; HFE c.340+4T>C; HLA-B *1502, *5701, *5801; HTR1A c.-1019G>C, c.659G>T; HTR2A c.614 -2211T>C; HTR2C c.-759C>T, c.551-3008C>G; IFNL3 g.39738787C>T, g.39743165T>G; ITPA c.94C>A, c.124+21A>C; KIF6 c.2155T>C; LDLR c.1773C>T; MTHFR C677T, A1298C; NAT2 *4, *5, *6, *7, *12, *13; NOS1AP c.106-38510G>T, c.178-20044C>T, c.178-13122C>T; NQO1 c.559C>T; OPRM1 c.118A>G, c.290+1050C>T; SCN2A c.971-32A>G; SLC6A4 5-HTTLPR LA, 5-HTTLPR LG, 5-HTTLPR S; SLCO1B1 *5; TPMT *1, *2, *3A, *3B, *3C, *4; UGT1A1 *28; UGT2B15 *2; VKORC1 c.-1639G>A; XRCC1 c.1196A>G. A normal (wild type) genotype signifies the absence of the targeted alleles and does not indicate the absence of other mutations not covered by the assay. The possibility cannot be ruled out that the indicated genotypes may be present but below the limits of detection for this assay.*

General Pharmacogenomics References:

1. Drug labels with pharmacogenomics information:
   https://www.pharmgkb.org/view/drug-labels.do

2. Pharmacogenomics drug dosing guidelines:
   https://www.pharmgkb.org/view/dosing-guidelines.do

3. Clinical Pharmacogenetics Implementation Consortium (CPIC) drug dosing guidelines:
   https://cpicpgx.org/guidelines

4. FDA drug labels

5. Warfarin dosing guideline:
   CPIC Guidelines for CYP2C9 and VKORC1 Genotypes and Warfarin Dosing

Electronic Signature

Laboratory Director
ABMG Certified, Clinical Molecular Genetics