SAMPLE REPORT

Admera Health, LLC
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PATIENT INFORMATION
Name: Smith, John
DOB: October 9, 1957
Age: 59
Sex: Male
Address: 126 Corporate Blvd.
South Plainfield, NJ 07080

SAMPLE
Date Collected: October 25, 2016
Date Received: October 25, 2016
Case ID: PGXPL16-000196
Source: Buccal Swabs

REFERRING PHYSICIAN
Name: Jane Doe, MD
Institution: Local Hospital
Phone: 123-456-7890

Comprehensive Drug Information for Smith, John

ICD-10: C34.90 Malignant neoplasm of unsp part of unsp bronchus or lung; F33.9 Major depressive disorder, recurrent, unspecified; G89.3 Neoplasm related pain (acute) (chronic)

CONSIDER ALTERNATIVE

Drug Impacted	Recommendation
Codeine (Codeine®)	CONSIDER ALTERNATIVES
Oxycodone (Oxycontin®)	
Folic Acid	
Risperidone (Risperdal®)	
Thioridazine (Mellaril®)	
Tramadol hydrochloride/ Acetaminophen (Ultracet®)	
Tramadol (Ultram®)	

DOSE RECOMMENDATION

Drug Impacted	Recommendation
Tramadol hydrochloride/ Acetaminophen (Ultracet®)	INCREASE DOSE
Tramadol (Ultram®)	
Buprenorphine (Subutex®)	DECREASE DOSE
Fentanyl (Duragesic®)	
Hydrocodone/ Acetaminophen (Vicodin®)	
Sufentanil (Sufenta®)	

NORMAL RESPONSE EXPECTED

Drug Impacted	Recommendation
Alfentanil (Alfenta®)	NORMAL RESPONSE EXPECTED
Morphine (MS Contin®)	
Aripiprazole (Abilify®)	
Aripiprazole (Abilify®)	
Iloperidone (Fanapt®)	
Pimozide (Orap®)	

PROCEED WITH CAUTION

Drug Impacted	Recommendation
Buprenorphine (Subutex®)	USE CAUTION
Fentanyl (Duragesic®)	
Hydrocodone/ Acetaminophen (Vicodin®)	
Sufentanil (Sufenta®)	
Carboplatin (Paraplatin®)	
Cisplatin (Platinol®)	

Only selected drugs are listed here due to limited space.
Please refer to Patient Specific Genotype Results table for comprehensive illustration of drugs in each action category.

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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 Driven Results for Smith, John

PGxOnco™

ICD-10: C34.90 Malignant neoplasm of unsp part of unsp bronchus or lung;F33.9 Major depressive disorder, recurrent, unspecified;G89.3 Neoplasm related pain (acute) (chronic)

Action	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
	Antipsychotics:				
	Risperidone (Risperdal®)	●	**CONSIDER ALTERNATIVES** (e.g., quetiapine, olanzapine, clozapine)	**CYP2D6** *4/*10	Intermediate Metabolizer
	Antipsychotics:				
	Thioridazine (Mellaril®)	●	**CONSIDER ALTERNATIVES**	**CYP2D6** *4/*10	Intermediate Metabolizer
	Opioids:				
	Codeine (Codeine®)	●	**CONSIDER ALTERNATIVES**	**CYP2D6** *4/*10	Intermediate Metabolizer
	Oxycodone (Oxycontin®)	◐			
	Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs):				
	Venlafaxine (Effexor®)	●	**CONSIDER ALTERNATIVES** (e.g., citalopram, sertraline)	**CYP2D6** *4/*10	Intermediate Metabolizer
	Vitamins:				
	Folic Acid	◐	**CONSIDER ALTERNATIVES** (e.g., supplements containing methylfolate) due to significantly reduced folic acid conversion	**MTHFR** C677T/C677T/A1298C	A1298C Heterozygous Mutation/C677T Homozygous Mutation
	Opioids:				
	Tramadol Hydrochloride /Acetaminophen (Ultracet®)	●	**CONSIDER ALTERNATIVES** (not oxycodone, codeine) OR	**CYP2D6** *4/*10	Intermediate Metabolizer
	Tramadol (Ultram®)	●	**INCREASE DOSE**		
	Opioids:				
	Methadone (Methadose®)	◐	**DECREASE DOSE**	**CYP2B6** G516T/G516T/A785G/A785G	G516T Homozygous/A785G Homozygous/Non T983C Homozygous
	Tetracyclic Antidepressants:				
	Maprotiline	◐	**DECREASE DOSE**	**CYP2D6** *4/*10	Intermediate Metabolizer
	Tricyclic Antidepressants:				
	Amitriptyline (Elavil®)	●	**DECREASE DOSE** by 25%	**CYP2D6** *4/*10	Intermediate Metabolizer
	Clomipramine (Anafranil®)	●			
	Desipramine (Norpramin®)	●			
	Doxepin (Silenor®)	●			
	Imipramine (Tofranil®)	●			
	Nortriptyline (Pamelor®)	●			
	Protriptyline (Vivactil®)	●			
	Trimipramine (Surmontil®)	●			

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Action	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
	Opioids:				
	Buprenorphine (Subutex®) Fentanyl (Duragesic®)	○ ○	**DECREASE DOSE** OR	**CYP3A4** *1A/*1B	Intermediate Metabolizer
	Hydrocodone /Acetaminophen (Vicodin®) Sufentanil (Sufenta®)	○ ○	**USE CAUTION** due to the risk of increased exposure to the drug leading to adverse events		
	Alkylating Agents:				
	Cyclophosphamide (Cytoxan®)	◐	**USE CAUTION** due to poorer response and increased risk of toxicity	**MTHFR** C677T/C677T/A1298C	A1298C Heterozygous Mutation/C677T Homozygous Mutation
	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
	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
	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
	Antimetabolites (Pyrimidine Analog):				
	Fluorouracil (Carac®)	◐	**USE CAUTION** due to poorer response and increased risk of toxicity	**MTHFR** C677T/C677T/A1298C	A1298C Heterozygous Mutation/C677T Homozygous Mutation
	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
	Antipsychotics:				
	Clozapine (Clozaril®) Olanzapine (Zyprexa®)	◐ ◐	**USE CAUTION** due to increased risk of side effects including hyperprolactinemia and weight gain	**ANKK1** WT/A1	A1 Heterozygous
	Chemotherapy Modulating Agents:				
	Leucovorin (Wellcovorin®)	◐	**USE CAUTION** due to poorer response and increased risk of toxicity	**MTHFR** C677T/C677T/A1298C	A1298C Heterozygous Mutation/C677T Homozygous Mutation
	Folate Antimetabolites:				
	Methotrexate (Trexall®)	◐	**USE CAUTION** due to poorer response and increased risk of toxicity	**MTHFR** C677T/C677T/A1298 C	A1298C Heterozygous Mutation/C677T Homozygous Mutation
	Folate Antimetabolites:				
	Pemetrexed (Alimta®)	◐	**USE CAUTION** due to poorer response and increased risk of toxicity	**MTHFR** C677T/C677T/A1298 C	A1298C Heterozygous Mutation/C677T Homozygous Mutation
	Platinum Analog:				
	Carboplatin (Paraplatin®) Cisplatin (Platinol®) Oxaliplatin (Eloxatin®)	◐ ◐ ◐	**USE CAUTION** due to decreased survival and response	**XRCC1** WT/WT	rs25487 T Allele Carrier

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Action	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
!	**Platinum Analog:**				
	Carboplatin (Paraplatin®)	◐	**USE CAUTION** due to poorer response and increased risk of toxicity	**MTHFR** C677T/C677T/A1298C	A1298C Heterozygous Mutation/C677T Homozygous Mutation
	Oxaliplatin (Eloxatin®)	◐			
!	**Platinum Analog:**				
	Cisplatin (Platinol®)	◐	**USE CAUTION** due to worse outcome including overall survival and progression-free survival	**NQO1** c.559C>T/c.559C>T	rs1800566 AA genotype
	Oxaliplatin (Eloxatin®)	◐			
!	**Selective Serotonin Reuptake Inhibitors (SSRIs):**				
	Citalopram (Celexa®)	◐	**USE CAUTION** due to less improvement in symptoms	**HTR2A** c.614-2211T>C/c.614-2211T>C	rs7997012 GG genotype
!	**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):**				
	Sertraline (Zoloft®)	◐	**USE CAUTION** with high alert to adverse drug events	**CYP2C19** *1/*2	Intermediate Metabolizer
✓	**Antiemetics (Selective 5- HT3 Receptor Antagonist):**				
	Ondansetron (Zofran®)	◐	**NORMAL RESPONSE EXPECTED**	**ABCB1** WT/WT	rs2032582 AA genotype/rs1045642 AA genotype
✓	**Antipsychotics:**				
	Aripiprazole (Abilify®)	◐	**NORMAL RESPONSE EXPECTED**	**CYP3A4** *1A/*1B	Intermediate Metabolizer
✓	**Antipsychotics:**				
	Aripiprazole (Abilify®)	●	**NORMAL RESPONSE EXPECTED**	**CYP2D6** *4/*10	Intermediate Metabolizer
	Iloperidone (Fanapt®)	●			
	Pimozide (Orap®)	●			
✓	**Antipsychotics:**				
	Haloperidol (Haldol®)	◐	**NORMAL RESPONSE EXPECTED**	**CYP2D6** *4/*10	Intermediate Metabolizer
✓	**Antipsychotics:**				
	Perphenazine	●	**NORMAL RESPONSE EXPECTED**	**CYP2D6** *4/*10	Intermediate Metabolizer
✓	**Antipsychotics:**				
	Valproic Acid (Depakote®)	◐	**NORMAL RESPONSE EXPECTED**	**ANKK1** WT/A1	A1 Heterozygous
✓	**EGFR Tyrosine Kinase Inhibitors:**				
	Gefitinib (Iressa®)	◐	**NORMAL RESPONSE EXPECTED**	**CYP3A4** *1A/*1B	Intermediate Metabolizer

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Action	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
✓	**Opioids:**				
	Alfentanil (Alfenta®) Morphine (MS Contin®)	◐ ◐	**NORMAL RESPONSE EXPECTED**	**OPRM1** WT/WT	rs1799971 A Allele Carrier/rs510679 TT genotype
✓	**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** S/LA	HTTLPR Long Form
✓	**Selective Serotonin Reuptake Inhibitors (SSRIs):**				
	Fluvoxamine (Luvox®)	●	**NORMAL RESPONSE EXPECTED**	**CYP2D6** *4/*10	Intermediate Metabolizer
✓	**Selective Serotonin Reuptake Inhibitors (SSRIs):**				
	Fluvoxamine (Luvox®) Paroxetine (Paxil®)	◐ ◐	**NORMAL RESPONSE EXPECTED**	**HTR1A** WT/c.-1019G>C	rs6295 non-CC genotype/rs1800044 C Allele Carrier
✓	**Selective Serotonin Reuptake Inhibitors (SSRIs):**				
	Paroxetine (Paxil®)	●	**NORMAL RESPONSE EXPECTED**	**CYP2D6** *4/*10	Intermediate Metabolizer
✓	**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
✓	**Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs):**				
	Duloxetine (Cymbalta®)	○	**NORMAL RESPONSE EXPECTED**	**CYP1A2** *1A/*1A	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®) Trazodone (Desyrel®)	○ ○	**NORMAL RESPONSE EXPECTED**	**CYP3A4** *1A/*1B	Intermediate Metabolizer

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 Information for Smith, John

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Action	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
	Opioids:				
	Oxycodone	◐	**CONSIDER ALTERNATIVES**	**CYP2D6** *4/*10	Intermediate Metabolizer
	Folate Antimetabolites:				
	Pemetrexed	◐	**USE CAUTION** due to poorer response and increased risk of toxicity	**MTHFR** C677T/C677T/A1298C	A1298C Heterozygous Mutation/C677T Homozygous Mutation
	Platinum Analog:				
	Carboplatin	◐	**USE CAUTION** due to decreased survival and response	**XRCC1** WT/WT	rs25487 T Allele Carrier
	Platinum Analog:				
	Carboplatin	◐	**USE CAUTION** due to poorer response and increased risk of toxicity	**MTHFR** C677T/C677T/A1298C	A1298C Heterozygous Mutation/C677T Homozygous Mutation
	Antiemetics (Selective 5- HT3 Receptor Antagonist):				
	Ondansetron	◐	**NORMAL RESPONSE EXPECTED**	**ABCB1** WT/WT	rs2032582 AA genotype/rs1045642 AA genotype

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Drug-Drug Interactions for **Smith, John**

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Severity	Drugs	Warning	Documentation	Clinical Management
S	ONDANSETRON HYDROCHLORIDE -- OXYCODONE HYDROCHLORIDE	**MAJOR** Concurrent use of OXYCODONE and SEROTONERGIC AGENTS may result in increased risk of serotonin syndrome.	FAIR	Coadministration of oxycodone and another serotonergic agent may result in serotonin syndrome, because both drugs affect the serotonergic neurotransmitter system. If concomitant use of oxycodone and such an agent is clinically required, monitor patients carefully, especially during treatment initiation and dosage adjustment. Discontinue oxycodone if serotonin syndrome is suspected (Prod Info TROXYCA® ER oral extended-release capsules, 2016).

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Drug-Alcohol Interactions for **Smith, John**

Severity	Drugs	Warning	Documentation	Clinical Management
S	OXYCODONE HYDROCHLORIDE -- ETHANOL	**MAJOR** Concurrent use of OXYCODONE and ETHANOL may result in an increase in CNS or respiratory depression.	FAIR	Counsel patients on the potential for increased risk of CNS depression, including respiratory depression, hypotension, profound sedation, and coma, when alcohol is ingested with oxycodone. Patients should be instructed to avoid alcohol consumption while taking oxycodone (Prod Info OXYCONTIN® oral tablets, 2007).

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Drug-Lab Interactions for **Smith, John**

Severity	Drugs	Warning	Documentation	Clinical Management
	OXYCODONE HYDROCHLORIDE -- COCAINE MEASUREMENT	**MODERATE** OXYCODONE may result in interference with cocaine urine assay results due to cross-reactivity.	FAIR	Oxycodone may cross-react with some preliminary assays that are used to detect cocaine in the urine. Positive test results should be confirmed with a more specific chemical method, such as gas chromatography/mass spectrometry (GC/MS) which is the preferred confirmatory method (Prod Info PERCODAN® oral tablets, 2004).
	OXYCODONE HYDROCHLORIDE -- TETRAHYDROCANNABINOL MEASUREMENT	**MODERATE** OXYCODONE may result in interference with tetrahydrocannabinol urine assay results due to cross-reactivity.	FAIR	Oxycodone may cross-react with some preliminary assays that are used to detect tetrahydrocannabinol (cannabinoids) in the urine. Positive test results should be confirmed with a more specific chemical method, such as gas chromatography/mass spectrometry (GC/MS) which is the preferred confirmatory method (Prod Info PERCODAN® oral tablets, 2004).

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. Comprehensive Oncology Supportive Care Drugs for Smith, John

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Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Anesthesiology	**General Anesthetics:**				
	Ketamine (Ketalar®)	◐	DECREASE DOSE	CYP2B6 G516T/G516T/A785G/A785G	G516T Homozygous/A785G Homozygous/Non T983C Homozygous
	Propofol (Diprivan®)	◐			
Anesthesiology	**Local Anesthetics:**				
	Lidocaine (Lidoderm®)	○	NORMAL RESPONSE EXPECTED	CYP1A2 *1A/*1A	Normal Metabolizer
	Ropivacaine (Naropin®)	○			
Anesthesiology	**Sedatives:**				
	Dexmedetomidine (Precedex®)	◐	NORMAL DOSE may have an increased sedative response	ADRA2A c.-1252G>C/c.-1252G>C	rs1800544 CC genotype/rs1800545 GG genotype
Cardiology	**Anticoagulants:**				
	Warfarin (Coumadin®)	●	DECREASE DOSE Warfarin daily dose 3-4mg	CYP2C9 *1/*2	Intermediate Metabolizer
Cardiology	**Anticoagulants:**				
	Warfarin (Coumadin®)	●	DECREASE DOSE Warfarin daily dose 3-4mg	VKORC1 WT/-1639G>A	rs9923231 A Allele Carrier
Cardiology	**Anticoagulants:**				
	Phenprocoumon (Marcoumar®)	◐	NORMAL RESPONSE EXPECTED	CYP4F2 *1/*1	Normal Metabolizer
Cardiology	**Anticoagulants:**				
	Rivaroxaban (Xarelto®)	○	NORMAL RESPONSE EXPECTED	CYP3A4 *1A/*1B	Intermediate Metabolizer
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®)	●			
Infectious Diseases	**Antihepaciviral Drugs:**				
	Boceprevir (Victrelis®)	○	USE CAUTION due to increased risk of ribavirin-induced hemolytic anemia	ITPA WT/WT	Non-protective Wild Type
	Peginterferon alfa-2b (PegIntron®)	◐			
	Ribavirin (Copegus®)	◐			
	Telaprevir (Incivo®)	○			
Infectious Diseases	**Antiretroviral Drugs:**				
	Efavirenz (Sustiva®)	●	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/Non T983C Homozygous
	Nevirapine (Viramune®)	◐			

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Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Infectious Diseases	**Antifungal Drugs:**				
	Voriconazole (Vfend®)	●	✓ NORMAL RESPONSE EXPECTED	**CYP2C19** *1/*2	Intermediate Metabolizer
Infectious Diseases	**Antimalarial Drugs:**				
	Chloroquine (Aralen®) Primaquine Phosphate (Primaquine®)	● ●	✓ NORMAL RESPONSE EXPECTED	**G6PD** WT/WT	Normal G6PD Efficiency
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/*1	Non *28 Allele Carrier
Infectious Diseases	**Antitubercular Agents:**				
	Isoniazid Pyrazinamide (Rifater®) Rifampin (Rifadin®)	● ● ●	✓ NORMAL RESPONSE EXPECTED	**NAT2** *5/*6/*12/*13	Normal Metabolizer
Infectious Diseases	**Miscellaneous Antibiotics:**				
	Dapsone Sulfamethoxazole /Trimethoprim (Bactrim®)	● ●	✓ NORMAL RESPONSE EXPECTED	**G6PD** WT/WT	Normal G6PD Efficiency
Infectious Diseases	**Miscellaneous Antibiotics:**				
	Nalidixic Acid (Neggram®) Nitrofurantoin (Macrobid®)	● ●	✓ NORMAL RESPONSE EXPECTED	**G6PD** WT/WT	Normal G6PD Efficiency
Oncology	**Antiemetics:**				
	Dexamethasone (Decadron®)	◐	✓ NORMAL RESPONSE EXPECTED	**ABCB1** WT/WT	rs2032582 AA genotype/rs1045642 AA genotype
Oncology	**Antiemetics (Selective 5-HT3 Receptor Antagonist):**				
	Dolasetron (Anzemet®) Granisetron (Sancuso®)	◐ ◐	✓ NORMAL RESPONSE EXPECTED	**NOS1AP** c.178-20044C>T/c.178-13122C>T	rs10494366 GG genotype/rs10800397 T Allele Carrier/rs10919035 T Allele Carrier
Oncology	**Antiemetics (Selective 5-HT3 Receptor Antagonist):**				
	Ondansetron (Zofran®)	◐	✓ NORMAL RESPONSE EXPECTED	**ABCB1** WT/WT	rs2032582 AA genotype/rs1045642 AA genotype
Pain Management	**Opioids:**				
	Codeine (Codeine®) Oxycodone (Oxycontin®)	◐ ◐	✗ CONSIDER ALTERNATIVES	**CYP2D6** *4/*10	Intermediate Metabolizer

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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/Non T983C Homozygous
Pain Management	**Opioids:**				
	Buprenorphine (Subutex®) Fentanyl (Duragesic®) Hydrocodone /Acetaminophen (Vicodin®) 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	**Nonsteroidal Antiinflammatory Drugs (NSAIDs):**				
	Celecoxib (Celebrex®) Diclofenac (Voltaren®) Meloxicam (Mobic®)	● ◐ ◐	**USE CAUTION** due to increased exposure to the drug	**CYP2C9** *1/*2	Intermediate Metabolizer
Pain Management	**Nonsteroidal Antiinflammatory Drugs (NSAIDs):**				
	Ibuprofen (Advil®) Naproxen (Aleve®)	○ ○	**USE CAUTION** due to the risk of increased exposure to the drug leading to adverse events	**CYP2C9** *1/*2	Intermediate Metabolizer
Pain Management	**Alpha-2 Adrenergic Agonists:**				
	Tizanidine (Zanaflex®)	○	**NORMAL RESPONSE EXPECTED**	**CYP1A2** *1A/*1A	Normal Metabolizer
Pain Management	**Opioids:**				
	Alfentanil (Alfenta®) 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/*1A	Normal Metabolizer

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Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
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	**Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs):**				
	Venlafaxine (Effexor®)	●	✖ **CONSIDER ALTERNATIVES** (e.g., citalopram, sertraline)	**CYP2D6** *4/*10	Intermediate Metabolizer
Psychiatry	**Tetracyclic Antidepressants:**				
	Maprotiline	◐	▼ **DECREASE DOSE**	**CYP2D6** *4/*10	Intermediate Metabolizer
Psychiatry	**Tricyclic Antidepressants:**				
	Amitriptyline (Elavil®) Clomipramine (Anafranil®) Desipramine (Norpramin®) Doxepin (Silenor®) Imipramine (Tofranil®) Nortriptyline (Pamelor®) Protriptyline (Vivactil®) Trimipramine (Surmontil®)	● ● ● ● ● ● ● ●	▼ **DECREASE DOSE** by 25%	**CYP2D6** *4/*10	Intermediate Metabolizer
Psychiatry	**Antimanic Agents:**				
	Lithium (Lithobid®)	◐	◆ **USE CAUTION** due to increased risk of suicidal ideation	**ABCB1** WT/WT	rs2032582 AA genotype/rs1045642 AA genotype
Psychiatry	**Antipsychotics:**				
	Clozapine (Clozaril®) Olanzapine (Zyprexa®)	◐ ◐	◆ **USE CAUTION** due to increased risk of side effects including hyperprolactinemia and weight gain	**ANKK1** WT/A1	A1 Heterozygous
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	**Selective Serotonin Reuptake Inhibitors (SSRIs):**				
	Citalopram (Celexa®)	◐	◆ **USE CAUTION** due to less improvement in symptoms	**HTR2A** c.614-2211T>C/c.614-2211T>C	rs7997012 GG genotype
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):**				
	Sertraline (Zoloft®)	◐	◆ **USE CAUTION** with high alert to adverse drug events	**CYP2C19** *1/*2	Intermediate Metabolizer

Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Psychiatry	**Smoking Cessation Aids:**				
	Bupropion (Zyban®)	◐	⚠ USE CAUTION due to reduced effectiveness	**ANKK1** WT/A1	A1 Heterozygous
Psychiatry	**Aldehyde Dehydrogenase Inhibitors:**				
	Disulfiram (Antabuse®)	◐	✓ NORMAL DOSE may have an increased likelihood of response	**ANKK1** WT/A1	A1 Heterozygous
Psychiatry	**Antipsychotics:**				
	Aripiprazole (Abilify®)	◐	✓ NORMAL RESPONSE EXPECTED	**CYP3A4** *1A/*1B	Intermediate Metabolizer
Psychiatry	**Antipsychotics:**				
	Aripiprazole (Abilify®)	●	✓ NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer
	Iloperidone (Fanapt®)	●			
	Pimozide (Orap®)	●			
Psychiatry	**Antipsychotics:**				
	Haloperidol (Haldol®)	◐	✓ NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer
Psychiatry	**Antipsychotics:**				
	Perphenazine	●	✓ NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer
Psychiatry	**Antipsychotics:**				
	Valproic Acid (Depakote®)	◐	✓ NORMAL RESPONSE EXPECTED	**ANKK1** WT/A1	A1 Heterozygous
Psychiatry	**Opioids Antagonists:**				
	Naloxone (Evzio®)	◐	✓ NORMAL RESPONSE EXPECTED	**OPRM1** WT/WT	rs1799971 A Allele Carrier/rs510679 TT genotype
	Naltrexone (Revia®)	◐			
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** S/LA	HTTLPR Long Form
Psychiatry	**Selective Serotonin Reuptake Inhibitors (SSRIs):**				
	Fluvoxamine (Luvox®)	●	✓ NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer

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Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Psychiatry	**Selective Serotonin Reuptake Inhibitors (SSRIs):**				
	Fluvoxamine (Luvox®) Paroxetine (Paxil®)	◐ ◐	✓ NORMAL RESPONSE EXPECTED	**HTR1A** WT/c.-1019G>C	rs6295 non-CC genotype/rs1800044 C Allele Carrier
Psychiatry	**Selective Serotonin Reuptake Inhibitors (SSRIs):**				
	Paroxetine (Paxil®)	●	✓ NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer
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
Psychiatry	**Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs):**				
	Duloxetine (Cymbalta®)	○	✓ NORMAL RESPONSE EXPECTED	**CYP1A2** *1A/*1A	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®) Trazodone (Desyrel®)	○ ○	✓ NORMAL RESPONSE EXPECTED	**CYP3A4** *1A/*1B	Intermediate Metabolizer

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IV. Chemotherapeutics for Smith, John

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Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Oncology	**Selective Estrogen Receptor Modulators (SERM):**				
	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	**Alkylating Agents:**				
	Cyclophosphamide (Cytoxan®)	◐	**USE CAUTION** due to poorer response and increased risk of toxicity	**MTHFR** C677T/C677T/A1298C	A1298C Heterozygous Mutation/C677T Homozygous Mutation
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	**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 poorer response and increased risk of toxicity	**MTHFR** C677T/C677T/A1298C	A1298C Heterozygous Mutation/C677T Homozygous Mutation
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	**Chemotherapy Modulating Agents:**				
	Leucovorin (Wellcovorin®)	◐	**USE CAUTION** due to poorer response and increased risk of toxicity	**MTHFR** C677T/C677T/A1298C	A1298C Heterozygous Mutation/C677T Homozygous Mutation
Oncology	**Chemotherapy Modulating Agents:**				
	Leucovorin (Wellcovorin®)	○	**USE CAUTION** due to decreased survival and response	**XRCC1** WT/WT	rs25487 T Allele Carrier
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:**				
	Methotrexate (Trexall®)	◐	USE CAUTION due to poorer response and increased risk of toxicity	**MTHFR** C677T/C677T/A1298C	A1298C Heterozygous Mutation/C677T Homozygous Mutation
Oncology	**Folate Antimetabolites:**				
	Pemetrexed (Alimta®)	◐	USE CAUTION due to poorer response and increased risk of toxicity	**MTHFR** C677T/C677T/A1298C	A1298C Heterozygous Mutation/C677T Homozygous Mutation
Oncology	**Platinum Analog:**				
	Carboplatin (Paraplatin®)	◐	USE CAUTION due to decreased survival and response	**XRCC1** WT/WT	rs25487 T Allele Carrier
	Cisplatin (Platinol®)	◐			
	Oxaliplatin (Eloxatin®)	◐			
Oncology	**Platinum Analog:**				
	Carboplatin (Paraplatin®)	◐	USE CAUTION due to poorer response and increased risk of toxicity	**MTHFR** C677T/C677T/A1298C	A1298C Heterozygous Mutation/C677T Homozygous Mutation
	Oxaliplatin (Eloxatin®)	◐			
Oncology	**Platinum Analog:**				
	Cisplatin (Platinol®)	◐	USE CAUTION due to increased risk for nephrotoxicity	**ERCC1** c.354T>C/c.*931T>G	rs3212986 C Allele Carrier/rs11615 non-AA genotype/rs735482 non-AA genotype
Oncology	**Platinum Analog:**				
	Cisplatin (Platinol®)	◐	USE CAUTION due to worse outcome including overall survival and progression-free survival	**NQO1** c.559C>T/c.559C>T	rs1800566 AA genotype
	Oxaliplatin (Eloxatin®)	◐			
Oncology	**Taxane Derivatives:**				
	Docetaxel (Taxotere®)	◐	USE CAUTION due to increased risk for nephrotoxicity	**ERCC1** c.354T>C/c.*931T>G	rs3212986 C Allele Carrier/rs11615 non-AA genotype/rs735482 non-AA genotype
Oncology	**Taxane Derivatives:**				
	Paclitaxel (Abraxane®)	◐	USE CAUTION due to increased risk for nephrotoxicity	**ERCC1** c.354T>C/c.*931T>G	rs3212986 C Allele Carrier/rs11615 non-AA genotype/rs735482 non-AA genotype
Oncology	**Antimetabolites (Purine Analog):**				
	Mercaptopurine (Purinethol®)	●	NORMAL RESPONSE EXPECTED	**TPMT** *1/*1	Normal Metabolizer
	Thioguanine (Tabloid®)	●			
Oncology	**Antimetabolites (Pyrimidine Analog):**				
	Capecitabine (Xeloda®)	●	NORMAL RESPONSE EXPECTED	**DPYD** *1/*1	Normal Metabolizer
	Pyrimidinedione (Tegafur-Uracil®)	◐			
Oncology	**Antimetabolites (Pyrimidine Analog):**				
	Cytarabine (Depocyt®)	◐	NORMAL RESPONSE EXPECTED	**CDA** WT/WT	rs532545 C Allele

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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/*1	Non *28 Allele Carrier
Oncology	**BRAF Kinase Inhibitors:**				
	Dabrafenib (Tafinlar®)	●	✓ NORMAL RESPONSE EXPECTED	**G6PD** WT/WT	Normal G6PD Efficiency
Oncology	**EGFR Tyrosine Kinase Inhibitors:**				
	Erlotinib (Tarceva®)	◐	✓ NORMAL RESPONSE EXPECTED	**UGT1A1** *1/*1	Non *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	**Immunomodulators:**				
	Thalidomide (Thalomid®)	◐	✓ NORMAL RESPONSE EXPECTED	**ERCC1** c.354T>C/c.*931T >G	rs3212986 C Allele Carrier/rs11615 non-AA genotype/rs735482 non-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/*1	Non *28 Allele Carrier
Oncology	**Urate-Oxidases (Recombinant):**				
	Rasburicase (Elitek®)	●	✓ NORMAL RESPONSE EXPECTED	**G6PD** WT/WT	Normal G6PD Efficiency
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

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V. Additional Drugs with Pharmacogenomics Information for Smith, John

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Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Cardiology	**Antiarrhythmic Drugs:**				
	Amiodarone (Cordarone®) Dronedarone (Multaq®)	◐ ◐	✖ **CONSIDER ALTERNATIVES**	**CYP3A4** *1A/*1B	Intermediate Metabolizer
Cardiology	**Antiarrhythmic Drugs:**				
	Propafenone (Rythmol®)	●	✖ **CONSIDER ALTERNATIVES** (e.g., sotalol, disopyramide, quinidine, amiodarone)	**CYP2D6** *4/*10	Intermediate Metabolizer
Cardiology	**Antiplatelets:**				
	Clopidogrel (Plavix®)	●	✖ **CONSIDER ALTERNATIVES** (if no contraindication e.g., prasugrel, ticagrelor)	**CYP2C19** *1/*2	Intermediate Metabolizer
Cardiology	**Antiplatelets:**				
	Ticagrelor (Brilinta®)	◐	✖ **CONSIDER ALTERNATIVES**	**CYP3A4** *1A/*1B	Intermediate Metabolizer
Cardiology	**Miscellaneous Cardiovascular Agents:**				
	Ivabradine (Corlanor®)	◐	✖ **CONSIDER ALTERNATIVES**	**CYP3A4** *1A/*1B	Intermediate Metabolizer
Cardiology	**Antilipemic Agents (Statins):**				
	Simvastatin (Zocor®)	◐	✖ **CONSIDER ALTERNATIVES** OR ▼ **DECREASE DOSE** to 20mg daily	**SLCO1B1** *5/*5	Low Activity
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	**Antiarrhythmic Drugs:**				
	Flecainide (Tambocor®)	◐	▼ **DECREASE DOSE** by 25%	**CYP2D6** *4/*10	Intermediate Metabolizer
Cardiology	**Antilipemic Agents (Statins):**				
	Atorvastatin (Lipitor®)	◐	▼ **DECREASE DOSE** to lowest necessary dose daily due to Increased risk for myopathy and rhabdomyolysis	**CYP3A4** *1A/*1B	Intermediate Metabolizer

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Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Cardiology	**Antilipemic Agents (Statins):**				
	Atorvastatin (Lipitor®) Pitavastatin (Livalo®) Pravastatin (Pravachol®) Rosuvastatin (Crestor®)	◐ ◐ ◐ ◐	**DECREASE DOSE**	**SLCO1B1** *5/*5	Low Activity
Cardiology	**Antilipemic Agents (Statins):**				
	Lovastatin (Mevacor®)	◐	**DECREASE DOSE** to lowest necessary dose daily due to Increased risk for myopathy and rhabdomyolysis OR **USE CAUTION** due to increased risk of adverse reactions	**CYP3A4** *1A/*1B	Intermediate Metabolizer
Cardiology	**Antiarrhythmic Drugs:**				
	Digoxin (Lanoxin®)	◐	**USE CAUTION** due to the increased risk of drug toxicity leading to adverse events	**ABCB1** WT/WT	rs2032582 AA genotype/rs1045642 AA genotype
Cardiology	**Calcium Channel Blockers:**				
	Amlodipine (Norvasc®) Diltiazem (Cardizem®) Felodipine (Plendil®) Lercanidipine (Zanidip®) Nisoldipine (Sular®) Nitrendipine (Nitrepin®)	◐ ○ ○ ○ ○ ◐	**USE CAUTION** due to significant increase in drug exposure and therefore clinical monitoring and dose adjustment may thus be required	**CYP3A4** *1A/*1B	Intermediate Metabolizer
Cardiology	**Calcium Channel Blockers:**				
	Nifedipine (Adalat®)	○	**USE CAUTION** due to increased risk for QTc prolongation	**NOS1AP** c.178-20044C>T/c.178-13122C>T	rs10494366 GG genotype/rs10800397 T Allele Carrier/rs10919035 T Allele Carrier
Cardiology	**Calcium Channel Blockers:**				
	Verapamil (Calan®)	◐	**USE CAUTION** due to increased risk for QTc prolongation	**NOS1AP** c.178-20044C>T/c.178-13122C>T	rs10494366 GG genotype/rs10800397 T Allele Carrier/rs10919035 T Allele Carrier
Cardiology	**ACE Inhibitors:**				
	Benazepril (Lotensin®) Perindopril (Aceon®)	◐ ◐	**NORMAL RESPONSE EXPECTED**	**ACE** WT/WT	ACE Deletion
Cardiology	**ACE Inhibitors:**				
	Captopril (Capoten®) Perindopril (Aceon®)	◐ ◐	**NORMAL RESPONSE EXPECTED**	**AGTR1** WT/WT	rs5186 AA genotype
Cardiology	**ACE Inhibitors:**				
	Captopril (Capoten®) Quinapril (Accupril®)	◐ ◐	**NORMAL RESPONSE EXPECTED**	**ACE** WT/WT	ACE Deletion

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Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Cardiology	**Angiotensin II Receptor Blockers:**				
	Candesartan (Atacand®)	◐	✓ NORMAL RESPONSE EXPECTED	**AGTR1** WT/WT	rs5186 AA genotype
Cardiology	**Angiotensin II Receptor Blockers:**				
	Irbesartan (Avapro®)	◐	✓ NORMAL RESPONSE EXPECTED	**ACE** WT/WT	ACE Deletion
Cardiology	**Angiotensin II Receptor Blockers:**				
	Losartan (Cozaar®)	◐	✓ NORMAL RESPONSE EXPECTED	**ABCB1** WT/WT	rs2032582 AA genotype/rs1045642 AA genotype
Cardiology	**Angiotensin II Receptor Blockers:**				
	Losartan (Cozaar®)	◐	✓ NORMAL RESPONSE EXPECTED	**AGTR1** WT/WT	rs5186 AA genotype
Cardiology	**Antianginal Drugs:**				
	Ranolazine (Ranexa®)	◐	✓ NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer
Cardiology	**Antilipemic Agents (Statins):**				
	Fluvastatin (Lescol®)	◐	✓ NORMAL RESPONSE EXPECTED	**ACE** WT/WT	ACE Deletion
Cardiology	**Beta Blockers:**				
	Atenolol (Tenormin®)	◐	✓ NORMAL RESPONSE EXPECTED	**ADRA2A** c.-1252G>C/c.-1252G>C	rs1800544 CC genotype/rs1800545 GG genotype
Cardiology	**Beta Blockers:**				
	Carvedilol (Coreg®)	●	✓ NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer
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	**Phosphodiesterase Inhibitors:**				
	Cilostazol (Pletal®)	◐	✓ NORMAL RESPONSE EXPECTED	**CYP3A4** *1A/*1B	Intermediate Metabolizer

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Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
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®)	◐	◆ USE CAUTION due to decreased drug response	**ATM** c.175-5285G>T/c.175-5285G>T	rs11212617 AA genotype
Endocrinology	**Thiazolidinediones:**				
	Pioglitazone (Actos®)	◐	◆ USE CAUTION due to higher risk of side effects caused by decreased drug metabolism	**CYP2C8** *1/*3	Allele 3 Carrier
Endocrinology	**Thiazolidinediones:**				
	Rosiglitazone (Avandia®)	◐	◆ USE CAUTION due to decreased response caused by increased drug metabolism	**CYP2C8** *1/*3	Allele 3 Carrier
Endocrinology	**Sulfonylureas:**				
	Chlorpropamide (Diabinese®)	●	✓ NORMAL RESPONSE EXPECTED	**G6PD** WT/WT	Normal G6PD Efficiency
	Glimepiride (Amaryl®)	●			
	Glipizide (Glucotrol®)	●			
	Glyburide (Glynase®)	●			
	Tolbutamide	○			
Gynecology	**Hormonal Contraceptives:**				
	Ethinyl Estradiol/Norelgestromin (Ortho Evra®)	●	✗ CONSIDER ALTERNATIVES (e.g., copper intrauterine device, progestin-only contraceptive) with presence of positive family history of thrombotic events OR ◆ USE CAUTION by avoid additional risk factors (e.g., obesity, smoking) with absence of positive family history of thrombotic events	**F5** WT/c.1601G> A	Factor V Leiden Carrier
Gynecology	**Hormones:**				
	Oral-Contraceptive	◐	✓ NORMAL RESPONSE EXPECTED	**F2** WT/WT	Wild Type
Hematology	**Colony Stimulating Factors:**				
	Eltrombopag (Promacta®)	●	◆ USE CAUTION due to the potential for an increased risk of thromboembolism	**F5** WT/c.1601G> A	Factor V Leiden Carrier
Immunology	**Immunosuppressant Agents:**				
	Cyclosporine (Gengraf®)	◐	◆ USE CAUTION due to the increased risk of drug rejection and acute post-transplant rejection	**ABCB1** WT/WT	rs2032582 AA genotype/rs1045642 AA genotype

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Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Immunology	**5-Aminosalicylic Acid Derivatives:**				
	Sulfasalazine (Azulfidine®)	●	✓ NORMAL RESPONSE EXPECTED	**G6PD** WT/WT	Normal G6PD Efficiency
Immunology	**Antirheumatic Immunosuppressants:**				
	Methotrexate (Trexall®)	◐	✓ NORMAL RESPONSE EXPECTED	**ITPA** WT/WT	Non-protective Wild Type
Immunology	**Immunosuppressant Agents:**				
	Sirolimus (Rapamune®)	◐	✓ NORMAL RESPONSE EXPECTED	**CYP3A4** *1A/*1B	Intermediate Metabolizer
Immunology	**Immunosuppressant Agents:**				
	Sirolimus (Rapamune®) Tacrolimus (Prograf®)	◐ ◐	✓ NORMAL RESPONSE EXPECTED	**CYP3A5** *3A/*3A	Non 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®)	●	✓ NORMAL RESPONSE EXPECTED	**G6PD** WT/WT	Normal G6PD Efficiency
Immunology	**Uricosuric Agents:**				
	Probenecid	●	✓ NORMAL RESPONSE EXPECTED	**G6PD** WT/WT	Normal G6PD Efficiency
Immunology	**Xanthine Oxidase Inhibitors:**				
	Allopurinol (Zyloprim®)	●	✓ NORMAL RESPONSE EXPECTED	**HLA-B** WT/WT	Wild Type
Neurology	**Benzodiazepines:**				
	Alprazolam (Xanax®)	○	▼ DECREASE DOSE OR ◆ USE CAUTION	**CYP3A4** *1A/*1B	Intermediate Metabolizer
Neurology	**Other Stimulants:**				
	Cannabinoids	◐	◆ USE CAUTION due to increased risk of tetrahydrocannabinol (THC) dependence	**FAAH** WT/WT	rs324420 CC genotype

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Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Neurology	**Anti-Anxiety Agents:**				
	Buspirone (Buspar®)	○	✓ NORMAL RESPONSE EXPECTED	**HTR1A** WT/c.-1019G>C	rs6295 non-CC genotype/rs1800044 C Allele Carrier
Neurology	**Anticonvulsant Drugs:**				
	Carbamazepine (Tegretol®)	◐	✓ NORMAL RESPONSE EXPECTED	**SCN2A** WT/WT	rs2304016 non-GG genotype
	Lamotrigine (Lamictal®)	◐			
	Oxcarbazepine (Trileptal®)	◐			
	Phenytoin (Dilantin®)	◐			
	Topiramate (Topamax®)	◐			
Neurology	**Anticonvulsant Drugs:**				
	Carbamazepine (Tegretol®)	●	✓ NORMAL RESPONSE EXPECTED	**HLA-B** WT/WT	Wild Type
	Phenytoin (Dilantin®)	●			
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	**Antimigraine Agents:**				
	Eletriptan (Relpax®)	○	✓ NORMAL RESPONSE EXPECTED	**CYP3A4** *1A/*1B	Intermediate Metabolizer
	Zolmitriptan (Zomig®)	○			
Neurology	**Benzodiazepines:**				
	Lorazepam (Ativan®)	◐	✓ NORMAL RESPONSE EXPECTED	**UGT2B15** *1/*2	rs1902023 non-AA genotype
	Oxazepam (Serax®)	◐			
Neurology	**Central Monoamine-Depleting Agents:**				
	Tetrabenazine (Xenazine®)	●	✓ NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer
Neurology	**CNS Stimulants (ADHD):**				
	Amphetamine (Adderall®)	◐	✓ NORMAL RESPONSE EXPECTED	**OPRM1** WT/WT	rs1799971 A Allele Carrier/rs510679 TT genotype
Neurology	**CNS Stimulants (ADHD):**				
	Amphetamine (Adderall®)	◐	✓ NORMAL RESPONSE EXPECTED	**COMT** WT/WT	Non MET Homozygous
	Dexmethylphenidate (Focalin®)	◐			
	Dextroamphetamine (Adderall®)	◐			
	Lisdexamfetamine (Vyvanse®)	○			
	Methylphenidate (Ritalin®)	◐			

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Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Neurology	**CNS Stimulants (ADHD):**				
	Dextroamphetamine (Adderall®) Methylphenidate (Ritalin®)	◐ ◐	✓ NORMAL RESPONSE EXPECTED	**DRD1** WT/c.-48G>A	rs4532 non-CC genotype
Neurology	**CNS Stimulants (ADHD):**				
	Methamphetamine (Desoxyn®)	◐	✓ NORMAL RESPONSE EXPECTED	**FAAH** WT/WT	rs324420 CC genotype
Neurology	**CNS Stimulants (ADHD):**				
	Methylphenidate (Ritalin®)	◐	✓ NORMAL RESPONSE EXPECTED	**CES1** WT/WT	rs71647871 C Allele
Neurology	**CNS Stimulants (ADHD):**				
	Nicotine (Nicoderm®)	◐	✓ NORMAL RESPONSE EXPECTED	**COMT** WT/WT	Non MET Homozygous
Neurology	**COMT Inhibitors:**				
	Entacapone (Comtan®)	◐	✓ NORMAL RESPONSE EXPECTED	**COMT** WT/WT	Non MET Homozygous
Neurology	**Other Stimulants:**				
	Cocaine	◐	✓ NORMAL RESPONSE EXPECTED	**CNR1** WT/c.*3475A> G	rs806368 non-TT genotype
Neurology	**Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs):**				
	Atomoxetine (Strattera®)	●	✓ NORMAL RESPONSE EXPECTED	**CYP2D6** *4/*10	Intermediate Metabolizer
Rheumatology	**Nonsteroidal Antiinflammatory Drugs (NSAIDs):**				
	Flurbiprofen (Ansaid®)	●	✓ NORMAL RESPONSE EXPECTED	**CYP2C9** *1/*2	Intermediate Metabolizer
Supplements	**Vitamins:**				
	Folic Acid	◐	✗ CONSIDER ALTERNATIVES (e.g., supplements containing methylfolate) due to significantly reduced folic acid conversion	**MTHFR** C677T/C677T/A1298C	A1298C Heterozygous Mutation/C677T Homozygous Mutation
Toxicology	**Antidotes:**				
	Ethanol	◐	◆ USE CAUTION due to increased risk for alcoholism	**ANKK1** WT/A1	A1 Heterozygous
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

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Therapeutic	Drug Impacted	Evidence Level	Clinical Interpretation	Gene/Genotype	Phenotype
Urology	**Anticholinergic Agents:**				
	Darifenacin (Enablex®)	●	✓ **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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Appendix I.
Patient PGxOnco™ Genotype and Phenotype Results for Smith, John

PGxOnco™

Gene	Genotype	Phenotype
ABCB1	WT/WT	rs2032582 AA genotype/rs1045642 AA genotype
ACE	WT/WT	ACE Deletion
ADRA2A	c.-1252G>C/c.-1252G>C	rs1800544 CC genotype/rs1800545 GG genotype
AGTR1	WT/WT	rs5186 AA genotype
ANKK1	WT/A1	A1 Heterozygous
APOE	WT/WT	Non E2 Carrier
ATM	c.175-5285G>T/c.175-5285G>T	rs11212617 AA genotype
CDA	WT/WT	rs532545 C Allele
CES1	WT/WT	rs71647871 C Allele
CNR1	WT/c.*3475A>G	rs806368 non-TT genotype
COMT	WT/WT	Non MET Homozygous
CYP1A2	*1A/*1A	Normal Metabolizer
CYP2B6	G516T/G516T/A785G/A785G	G516T Homozygous/A785G Homozygous/Non T983C Homozygous
CYP2C19	*1/*2	Intermediate Metabolizer
CYP2C8	*1/*3	Allele 3 Carrier
CYP2C9	*1/*2	Intermediate Metabolizer
CYP2D6	*4/*10	Intermediate Metabolizer
CYP3A4	*1A/*1B	Intermediate Metabolizer
CYP3A5	*3A/*3A	Non Expresser
CYP4F2	*1/*1	Normal Metabolizer
DPYD	*1/*1	Normal Metabolizer
DRD1	WT/c.-48G>A	rs4532 non-CC genotype
DRD2	WT/WT	rs1799978 TT genotype
ERCC1	c.354T>C/c.*931T>G	rs3212986 C Allele Carrier/rs11615 non-AA genotype/rs735482 non-AA genotype

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Gene	Genotype	Phenotype
F2	WT/WT	Wild Type
F5	WT/c.1601G>A	Factor V Leiden Carrier
FAAH	WT/WT	rs324420 CC genotype
G6PD	WT/WT	Normal G6PD Efficiency
GRIK4	WT/WT	rs1954787 TT genotype
GSTP1	WT/c.313A>G	rs1695 AG genotype
HLA-B	WT/WT	Wild Type
HTR1A	WT/c.-1019G>C	rs6295 non-CC genotype/rs1800044 C Allele Carrier
HTR2A	c.614-2211T>C/c.614-2211T>C	rs7997012 GG genotype
HTR2C	c.551-3008C>G/c.551-3008C>G	rs1414334 G Allele Carrier
IFNL3	WT/WT	Favorable Response Genotype
ITPA	WT/WT	Non-protective Wild Type
KIF6	WT/c.2155T>C	rs20455 non-AA genotype
MTHFR	C677T/C677T/A1298C	A1298C Heterozygous Mutation/C677T Homozygous Mutation
NAT2	*5/*6/*12/*13	Normal Metabolizer
NOS1AP	c.178-20044C>T/c.178-13122C>T	rs10494366 GG genotype/rs10800397 T Allele Carrier/rs10919035 T 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	S/LA	HTTLPR Long Form
SLCO1B1	*5/*5	Low Activity
TPMT	*1/*1	Normal Metabolizer
UGT1A1	*1/*1	Non *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

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Appendix II. PGxOnco™ Panel Genes and Variants:

This test only detects those genes and variants listed below. 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. The panel includes 50 genes and 211 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.

Gene	Allele Type	Alleles
ABCB1	Decreased Activity	rs1045642, rs2032582
ACE	Decreased Activity	rs1799752
ADRA2A	Decreased Activity	rs1800544, rs1800545
AGTR1	Decreased Activity	rs5186
ANKK1	Decreased Activity	rs1800497
APOE	Decreased Activity	rs7412
ATM	Decreased Metformin Response	rs11212617
CDA	Decreased Activity	rs532545
CES1	Decreased Activity	rs71647871
CNR1	Decreased Activity	rs806368
COMT	Decreased Activity	rs4680
CYP1A2	Active	*1A
	Increased Activity	*1F
	Decreased Activity	*1C, *1K, *3, *4, *7
	Inactive	*6
CYP2B6	Decreased Activity	*6, *18
CYP2C19	Active	*1
	Increased Activity	*17
	Decreased Activity	*9, *10
	Inactive	*2, *3, *4, *5, *6, *7, *8, *12
CYP2C8	Decreased Activity	*3
CYP2C9	Active	*1
	Decreased Activity	*2, *3, *4, *5, *8, *9, *11, *12, *13, *14, *16
	Inactive	*6, *15
CYP2D6	Active	*1, *2, *35
	Decreased Activity	*9, *10, *17, *29, *41
	Inactive	*3, *4, *6, *7, *8, *11, *12, *14, *19, *20, *21, *38, *40, *44
	Deletion	*5
	Amplification	*1XN, *2XN, *4XN, *10XN, *17XN, *29xN, *35xN, *41XN
CYP3A4	Active	*1A
	Decreased Activity	*1B, *2, *3, *12, *17
CYP3A5	Active	*1A
	Decreased Activity	*2, *7, *8, *9
	Inactive	*3A, *3B, *6

CYP4F2	Active	*1
	Decreased Activity	*3
DPYD	Active	*1, *4, *5, *6, *9A
	Decreased Activity	*9B, *10
	Inactive	*2A, *3, *7, *8, *11, *12, *13, 496A>G, IVS10-15T>C, 1845G>T, 2846A>T
DRD1	Decreased Activity	rs4532
DRD2	Decreased Activity	rs1799978
ERCC1	Decreased Activity	rs3212986, rs11615, rs735482
F2	Prothrombin Mutation	G20210A
F5	Increased Activity	rs6025
FAAH	Decreased Activity	rs324420
G6PD	Decreased Activity	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	Decreased Activity	rs1954787
GSTP1	Decreased Activity	rs1695
HLA-B	Carbamazepine ADR	*1502
	Abacavir Hypersensitivity	*5701
	Allopurinol ADR	*5801
HTR1A	Decreased Activity	rs1800044, rs6295
HTR2A	Decreased Activity	rs7997012
HTR2C	Decreased Activity	rs1414334, rs3813929
IFNL3	Decreased Activity	rs12979860, rs8099917
ITPA	Decreased Activity	rs1127354, rs7270101
KIF6	Decreased Activity	rs20455
MTHFR	Decreased Activity	C677T, A1298C
NAT2	Active	*4, *12, *13
	Inactive	*5, *6, *7
NOS1AP	Decreased Activity	rs10494366, rs10800397, rs10919035
NQO1	Decreased Activity	rs1800566
OPRM1	Decreased Activity	rs1799971, rs510769
SCN2A	Decreased Activity	rs2304016
SLC6A4	Decreased Activity	5-HTTLPR L_A, 5-HTTLPR L_G, 5-HTTLPR S
SLCO1B1	Decreased Activity	*5
TPMT	Active	*1
	Inactive	*2, *3A, *3B, *3C, *4
UGT1A1	Decreased Activity	*28
UGT2B15	Decreased Activity	rs1902023
VKORC1	Increased Warfarin Sensitivity	-1639G>A
XRCC1	Decreased Activity	rs25487

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Assay Methodology and Limitations for PGxOnco™ Panel:

Pharmacogenomics testing to assess how a patient may respond to prescribed drugs was performed by massively parallel Next Generation Sequencing (NGS). PGxOnco™ 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. PGxOnco™ 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 PGxOnco™ 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.

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. FDA Orange Book Search Engine:
   http://www.accessdata.fda.gov/scripts/cder/ob/default.cfm

4. Warfarin dosing guideline:
   Clinical Pharmacogenetics Implementation Consortium Guidelines
   for CYP2C9 and VKORC1 Genotypes and Warfarin Dosing

Electronic Signature

Laboratory Director
ABMG Certified, Clinical Molecular Genetics