Admera Health, LLC
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**PATIENT INFORMATION**

Name: Smith, John
DOB: October 9, 1973
Age: 44
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®)<br>Lisdexamfetamine (Vyvanse®)<br>Methamphetamine (Desoxyn®) | Amphetamine/Dextroamphetamine (Adderall®)<br>Dextroamphetamine (Dexedrine®)<br>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®)<br>Lorazepam (Ativan®)<br>Midazolam (Versed®)<br>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®)<br>Vilazodone (Viibryd®)<br>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®)<br>Paroxetine (Paxil®)<br>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®)<br>Levomilnacipran (Fetzima®)<br>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®)<br>Brexpiprazole (Rexulti®)<br>Haloperidol (Haldol®)<br>Iloperidone (Fanapt®)<br>Perphenazine<br>Pimozide (Orap®) | Chlorpromazine<br>Fluphenazine | Due to possible increased QT interval |
| | Clozapine (Clozaril®) | Due to increased risk of side effects including hyperprolactinemia and weight gain |
| | Olanzapine (Zyprexa®)<br>Quetiapine (Seroquel®) | Due to increased risk of side effects |
| **MOOD STABILIZER: ANTIMANIC AGENTS** | | |
| Carbamazepine (Tegretol®)<br>Lamotrigine (Lamictal®)<br>Valproic Acid (Depakote®) | Lithium (Lithobid®) | Due to possible less drug response |
| **OPIOID OVERDOSE: OPIOIDS ANTAGONISTS** | | |
| Naloxone (Evzio®)<br>Naltrexone (Revia®) | | |
| **OTHER STIMULANTS** | | |
| Cocaine | Cannabinoids | Due to increased risk of tetrahydrocannabinol (THC) dependence |

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Level of Evidence Legend

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

*Disclaimer: Recommendations with an evidence level of ○ are derived from medical literature and not the FDA/drug manufacture's package insert, or endorsed by established clinical guidelines. Healthcare providers should use their professional discretion when prescribing these drugs.*

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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<br>Fluphenazine | ◖<br>◖ | **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®)<br>Quetiapine (Seroquel®) | ◖<br>◖ | **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®)<br>Brexpiprazole (Rexulti®)<br>Iloperidone (Fanapt®)<br>Pimozide (Orap®) | ●<br>●<br>●<br>● | **NORMAL RESPONSE EXPECTED** | **CYP2D6** *4/*10 | Intermediate Metabolizer |

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| 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**<br>due to reduced response and increased risk of side effects | **CYP2B6**<br>G516T/G516T/A785G/A785G | G516T Homozygous/A785G Homozygous |
| ! | **Dopamine/Norepinephrine-Reuptake Inhibitors:** | | | | |
| | Bupropion (Wellbutrin®) | ◖ | **USE CAUTION**<br>due to reduced response and increased risk of side effects | **CYP2C19**<br>*1/*2 | Intermediate Metabolizer |
| ! | **Folate Antimetabolites:** | | | | |
| | Methotrexate (Trexall®) | ◖ | **USE CAUTION**<br>due to increased risk of toxicity caused by increased drug concentration | **ABCB1**<br>WT/WT | rs2032582 AA genotype/rs1045642 AA genotype |
| ! | **Folate Antimetabolites:** | | | | |
| | Methotrexate (Trexall®) | ◖ | **USE CAUTION**<br>due to poorer response and increased risk of toxicity | **MTHFR**<br>C677T/C677T/A1298C | A1298C Heterozygous Mutation/C677T Homozygous Mutation |
| ✖ | **Opioids:** | | | | |
| | Codeine (Codeine®)<br>Codeine/Acetaminophen (Tylenol #3 & #4®)<br>Hydrocodone/Acetaminophen (Vicodin®)<br>Oxycodone (Oxycontin®) | ◖<br>◖<br>◖<br>◖ | **CONSIDER ALTERNATIVES**<br>if no response | **CYP2D6**<br>*4/*10 | Intermediate Metabolizer |
| ✖ | **Opioids:** | | | | |
| | Tramadol Hydrochloride/Acetaminophen (Ultracet®)<br>Tramadol (Ultram®) | ●<br>● | **CONSIDER ALTERNATIVES**<br>(not oxycodone, codeine)<br>OR | **CYP2D6**<br>*4/*10 | Intermediate Metabolizer |
| ▲ | | | **INCREASE DOSE** | | |

| Action | Drug Impacted | Evidence Level | Clinical Interpretation | Gene/Genotype | Phenotype |
|---|---|---|---|---|---|
| | **Opioids:** | | | | |
| | Buprenorphine (Subutex®)<br>Fentanyl (Duragesic®)<br>Sufentanil (Sufenta®) | ○<br>○<br>○ | **DECREASE DOSE**<br>OR<br>**USE CAUTION**<br>due to the risk of increased exposure to the drug leading to adverse events | **CYP3A4**<br>*1A/*1B | Intermediate Metabolizer |
| | **Selective Serotonin Reuptake Inhibitors (SSRIs):** | | | | |
| | Citalopram (Celexa®) | ◖ | **USE CAUTION**<br>due to reduced response | **GRIK4**<br>WT/WT | rs1954787 T Allele Carrier |
| | **Selective Serotonin Reuptake Inhibitors (SSRIs):** | | | | |
| | Fluoxetine (Prozac®) | ● | **USE CAUTION**<br>due to elevated risk for drug overdose resulting in adverse events and drug interaction | **CYP2D6**<br>*4/*10 | Intermediate Metabolizer |
| | **Selective Serotonin Reuptake Inhibitors (SSRIs):** | | | | |
| | Fluvoxamine (Luvox®)<br>Paroxetine (Paxil®)<br>Sertraline (Zoloft®) | ◖<br>◖<br>◖ | **USE CAUTION**<br>due to reduced response | **HTR1A**<br>WT/WT | rs6295 CC genotype/rs1800044 C Allele Carrier |
| | **Selective Serotonin Reuptake Inhibitors (SSRIs):** | | | | |
| | Sertraline (Zoloft®) | ◖ | **USE CAUTION**<br>with high alert to adverse drug events | **CYP2C19**<br>*1/*2 | Intermediate Metabolizer |
| | **Selective Serotonin Reuptake Inhibitors (SSRIs):** | | | | |
| | Escitalopram (Lexapro®) | ● | **NORMAL RESPONSE EXPECTED** | **CYP2C19**<br>*1/*2 | Intermediate Metabolizer |
| | **Selective Serotonin Reuptake Inhibitors (SSRIs):** | | | | |
| | Escitalopram (Lexapro®) | ◖ | **NORMAL RESPONSE EXPECTED** | **SLC6A4**<br>LA/LA | HTTLPR Long Form |
| | **Selective Serotonin Reuptake Inhibitors (SSRIs):** | | | | |
| | Vilazodone (Viibryd®) | ○ | **NORMAL RESPONSE EXPECTED** | **CYP3A4**<br>*1A/*1B | Intermediate Metabolizer |

| Action | Drug Impacted | Evidence Level | Clinical Interpretation | Gene/Genotype | Phenotype |
|---|---|---|---|---|---|
| ✓ | **Selective Serotonin Reuptake Inhibitors (SSRIs):** | | | | |
| | Vortioxetine (Trintellix®) | ● | **NORMAL RESPONSE EXPECTED** | **CYP2D6** *4/*10 | Intermediate Metabolizer |
| ✗ | **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 |

| Action | Drug Impacted | Evidence Level | Clinical Interpretation | Gene/Genotype | Phenotype |
|---|---|---|---|---|---|
| | **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®) | ● | | | |
| | Doxepin (Silenor®) | ● | | | |
| | Imipramine (Tofranil®) | ● | | | |
| | Protriptyline (Vivactil®) | ● | | | |
| | Trimipramine (Surmontil®) | ● | | | |
| | **Tricyclic Antidepressants:** | | | | |
| | Desipramine (Norpramin®) | ● | **DECREASE DOSE** by 25% | **CYP2D6** *4/*10 | Intermediate Metabolizer |
| | Nortriptyline (Pamelor®) | ● | | | |
| | **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 |

**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 |
| ! | **Folate Antimetabolites:** | | | | |
| | Methotrexate | | **USE CAUTION** due to poorer response and increased risk of toxicity | **MTHFR** C677T/C677T/A1298C | A1298C Heterozygous Mutation/C677T Homozygous Mutation |
| ✗ | **Opioids:** | | | | |
| | Acetaminophen | | **CONSIDER ALTERNATIVES** if no response | **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 |
| ? | **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 |

| Action | Drug Impacted | Evidence Level | Clinical Interpretation | Gene/Genotype | Phenotype |
|---|---|---|---|---|---|
| NA | **Hormones:** | | | | |
| | Megestrol | NA | **PHARMACOGENOMICS EVIDENCE NOT AVAILABLE** | NA | NA |
| NA | **Vitamins:** | | | | |
| | Multivitamins<br>Cholecalciferol | NA | **PHARMACOGENOMICS EVIDENCE NOT AVAILABLE** | NA | NA |

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# 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. |

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# 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. |



**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.

# 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®) | | | | | | | | | | × | | | | | | | | | | | | | | | |

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| 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®)<br>Propofol (Diprivan®) | ◖<br>◖ | DECREASE DOSE<br>due to decreased drug clearance | **CYP2B6**<br>G516T/G516T/A785G/A785G | G516T Homozygous/A785G Homozygous |
| Anesthesiology | **Local Anesthetics:** | | | | |
| | Lidocaine/Prilocaine (Emla®) | ● | CONSIDER ALTERNATIVES<br>due to high susceptibility to drug-induced methemoglobinemia | **G6PD**<br>WT/Mediterranean | G6PD Deficiency |
| Anesthesiology | **Local Anesthetics:** | | | | |
| | Lidocaine (Lidoderm®)<br>Ropivacaine (Naropin®) | ○<br>○ | NORMAL RESPONSE EXPECTED | **CYP1A2**<br>*1A/*1F | Normal Metabolizer |
| Anesthesiology | **Sedatives:** | | | | |
| | Dexmedetomidine (Precedex®) | ◖ | NORMAL RESPONSE EXPECTED | **ADRA2A**<br>WT/c.-217G>A | rs1800544 GG genotype/rs1800545 GA genotype |
| Cardiology | **ACE Inhibitors:** | | | | |
| | Captopril (Capoten®)<br>Quinapril (Accupril®) | ◖<br>◖ | USE CAUTION<br>due to reduced response | **ACE**<br>WT/WT | ACE Deletion |
| Cardiology | **ACE Inhibitors:** | | | | |
| | Benazepril (Lotensin®)<br>Perindopril (Aceon®) | ◖<br>◖ | NORMAL RESPONSE EXPECTED | **ACE**<br>WT/WT | ACE Deletion |
| Cardiology | **ACE Inhibitors:** | | | | |
| | Perindopril (Aceon®) | ◖ | NORMAL RESPONSE EXPECTED | **AGTR1**<br>WT/WT | rs5186 AA genotype |
| Cardiology | **Angiotensin II Receptor Blockers:** | | | | |
| | Irbesartan (Avapro®) | ◖ | USE CAUTION<br>due to reduced response | **ACE**<br>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<br>Warfarin daily dose 5-7mg | **CYP2C9** *1/*1 | Normal Metabolizer |
| Cardiology | **Anticoagulants:** | | | | |
| | Warfarin (Coumadin®) | ● | ✓ NORMAL DOSE<br>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®)<br>Pravastatin (Pravachol®) | ◖<br>◖ | ! USE CAUTION<br>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<br>due to higher risk of developing myalgia | **ABCB1** WT/WT | rs2032582 AA genotype/rs1045642 AA genotype |
| Cardiology | **Antilipemic Agents (Statins):** | | | | |
| | Lovastatin (Mevacor®)<br>Rosuvastatin (Crestor®) | ◖<br>◖ | ✓ NORMAL RESPONSE EXPECTED | **CYP3A5** *1A/*3A | Expresser |

| Therapeutic | Drug Impacted | Evidence Level | Clinical Interpretation | Gene/Genotype | Phenotype |
|---|---|---|---|---|---|
| Cardiology | **Antilipemic Agents (Statins):** | | | | |
| | Pitavastatin (Livalo®)<br>Rosuvastatin (Crestor®) | ◖<br>◖ | ✓ NORMAL RESPONSE EXPECTED | **SLCO1B1**<br>*1/*1 | Normal Activity |
| Cardiology | **Antilipemic Agents (Statins):** | | | | |
| | Fluvastatin (Lescol®) | ◖ | ✓ NORMAL RESPONSE EXPECTED | **ACE**<br>WT/WT | ACE Deletion |
| Cardiology | **Antilipemic Agents (Statins):** | | | | |
| | Lovastatin (Mevacor®) | ○ | ✓ NORMAL RESPONSE EXPECTED | **LDLR**<br>c.1773C>T/c.1773C>T | rs688 TT Genotype |
| Cardiology | **Antilipemic Agents (Statins):** | | | | |
| | Simvastatin (Zocor®) | ◖ | ✓ NORMAL RESPONSE EXPECTED | **ABCB1**<br>WT/WT | rs2032582 AA genotype/rs1045642 AA genotype |
| Cardiology | **Antilipemic Agents (Statins):** | | | | |
| | Simvastatin (Zocor®) | ◖ | ✓ NORMAL RESPONSE EXPECTED | **SLCO1B1**<br>*1/*1 | Normal Activity |
| Cardiology | **Antiplatelets:** | | | | |
| | Clopidogrel (Plavix®) | ● | ✗ CONSIDER ALTERNATIVES<br>(if no contraindication e.g., prasugrel, ticagrelor) | **CYP2C19**<br>*1/*2 | Intermediate Metabolizer |
| Cardiology | **Antiplatelets:** | | | | |
| | Ticagrelor (Brilinta®) | ● | ✓ NORMAL DOSE | **CYP2C19**<br>*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®)<br>Propranolol (Inderal LA®) | ●<br>◖ | ✓ **NORMAL RESPONSE EXPECTED** | **CYP2D6** *4/*10 | Intermediate Metabolizer |
| Cardiology | **Calcium Channel Blockers:** | | | | |
| | Amlodipine (Norvasc®)<br>Nifedipine (Adalat®) | ◖<br>○ | ⚠ **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®)<br>Felodipine (Plendil®)<br>Lercanidipine (Zanidip®)<br>Nisoldipine (Sular®) | ○<br>○<br>○<br>○ | ✓ **NORMAL RESPONSE EXPECTED** | **CYP3A4** *1A/*1B | Intermediate Metabolizer |
| Cardiology | **Calcium Channel Blockers:** | | | | |
| | Nitrendipine (Nitrepin®) | ◖ | ✓ **NORMAL RESPONSE EXPECTED** | **AGTR1** WT/WT | rs5186 AA genotype |

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| Therapeutic | Drug Impacted | Evidence Level | Clinical Interpretation | Gene/Genotype | Phenotype |
|---|---|---|---|---|---|
| Cardiology | **Diuretics:** | | | | |
| | Bumetanide (Bumex®)<br>Furosemide (Lasix®)<br>Hydrochlorothiazide (Microzide®)<br>Torsemide (Demadex®) | ◖ | ✓ NORMAL RESPONSE EXPECTED | **ACE**<br>WT/WT | ACE Deletion |
| Cardiology | **Diuretics:** | | | | |
| | Hydrochlorothiazide (Microzide®) | ◖ | ✓ NORMAL RESPONSE EXPECTED | **AGTR1**<br>WT/WT | rs5186 AA genotype |
| Cardiology | **Diuretics:** | | | | |
| | Spironolactone (Aldactone®) | ◖ | ✓ NORMAL RESPONSE EXPECTED | **ACE**<br>WT/WT | ACE Deletion |
| Cardiology | **Miscellaneous Cardiovascular Agents:** | | | | |
| | Ivabradine (Corlanor®) | ◖ | ✓ NORMAL RESPONSE EXPECTED | **CYP3A4**<br>*1A/*1B | Intermediate Metabolizer |
| Cardiology | **Phosphodiesterase Inhibitors:** | | | | |
| | Cilostazol (Pletal®) | ◖ | ✓ NORMAL RESPONSE EXPECTED | **CYP3A5**<br>*1A/*3A | Expresser |
| Cardiology | **Vasodilators:** | | | | |
| | Hydralazine | ● | ! USE CAUTION<br>due to decreased drug response | **NAT2**<br>*4/*12 | Rapid Acetylator |
| Cardiology | **Vasodilators:** | | | | |
| | Nitroprusside (Nitropress®) | ◖ | ✓ NORMAL RESPONSE EXPECTED | **ACE**<br>WT/WT | ACE Deletion |
| Dentistry | **Cholinergic Agonists:** | | | | |
| | Cevimeline (Evoxac®) | ● | ✓ NORMAL RESPONSE EXPECTED | **CYP2D6**<br>*4/*10 | Intermediate Metabolizer |
| Endocrinology | **Biguanides:** | | | | |
| | Metformin (Glucophage®) | ◖ | ✓ NORMAL RESPONSE EXPECTED | **ATM**<br>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®)<br>Sirolimus (Rapamune®) | ◖<br>◖ | ▲ 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®)<br>Prednisolone (Orapred®)<br>Prednisone (Deltasone®) | ◖<br>◖<br>◖ | ✓ **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®)<br>Ledipasvir/Sofosbuvir (Harvoni®)<br>Peginterferon alfa-2b (PegIntron®)<br>Ribavirin (Copegus®)<br>Telaprevir (Incivo®) | ●<br>●<br>●<br>◖<br>● | ! **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®)<br>Peginterferon alfa-2b (PegIntron®)<br>Ribavirin (Copegus®)<br>Telaprevir (Incivo®) | ○<br>◖<br>◖<br>○ | ! **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®) | ● | ⚠ USE CAUTION | **G6PD** WT/Mediterranean | G6PD Deficiency |
| | Primaquine Phosphate (Primaquine®) | ● | due to high risk for hemolysis | | |
| | Quinine (Qualaquin®) | ● | | | |
| Infectious Diseases | **Antiretroviral Drugs:** | | | | |
| | Efavirenz (Sustiva®) | ● | ⚠ USE CAUTION | **CYP2B6** G516T/G516T/A785G/A785G | G516T Homozygous/A785G Homozygous |
| | Nevirapine (Viramune®) | ◖ | due to higher potential for an increased frequency and severity of drug-associated adverse events | | |
| 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®) | ◖ | ✓ NORMAL RESPONSE EXPECTED | **ABCB1** WT/WT | rs2032582 AA genotype/rs1045642 AA genotype |
| | Lopinavir/Ritonavir (Kaletra®) | ◖ | | | |
| | Zidovudine (Retrovir®) | ◖ | | | |
| Infectious Diseases | **Antiretroviral Drugs:** | | | | |
| | Nelfinavir (Viracept®) | ● | ✓ NORMAL RESPONSE EXPECTED | **CYP2C19** *1/*2 | Intermediate Metabolizer |
| Infectious Diseases | **Antitubercular Agents:** | | | | |
| | Ethambutol (Myambutol®) | ◖ | ✓ NORMAL RESPONSE EXPECTED | **NAT2** *4/*12 | Rapid Acetylator |
| | Isoniazid | ● | | | |
| | Pyrazinamide (Rifater®) | ● | | | |
| | Rifampin (Rifadin®) | ● | | | |
| 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<br>Sulfamethoxazole/Trimethoprim (Bactrim®) | ●<br>● | USE CAUTION due to an increased risk of hemolytic adverse reactions | **G6PD** WT/Mediterranean | G6PD Deficiency |
| Infectious Diseases | **Miscellaneous Antibiotics:** | | | | |
| | Nalidixic Acid (Neggram®)<br>Nitrofurantoin (Macrobid®) | ●<br>● | 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®)<br>Lamotrigine (Lamictal®)<br>Oxcarbazepine (Trileptal®)<br>Phenytoin (Dilantin®)<br>Topiramate (Topamax®) | ◖<br>◖<br>◖<br>◖<br>◖ | 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®)<br>Phenytoin (Dilantin®) | ●<br>● | ✓ NORMAL RESPONSE EXPECTED | **HLA-B**<br>WT/WT | Wild Type |
| Neurology | **Anticonvulsant Drugs:** | | | | |
| | Clobazam (Onfi®) | ● | ✓ NORMAL RESPONSE EXPECTED | **CYP2C19**<br>*1/*2 | Intermediate Metabolizer |
| Neurology | **Anticonvulsant Drugs:** | | | | |
| | Phenobarbital | ◖ | ✓ NORMAL RESPONSE EXPECTED | **ABCB1**<br>WT/WT | rs2032582 AA genotype/rs1045642 AA genotype |
| Neurology | **Anticonvulsant Drugs:** | | | | |
| | Valproic Acid (Depakote®) | ◖ | ✓ NORMAL RESPONSE EXPECTED | **ANKK1**<br>WT/c.2137G>A | A1 Heterozygous |
| Neurology | **Antimigraine Agents:** | | | | |
| | Eletriptan (Relpax®) | ○ | ✓ NORMAL RESPONSE EXPECTED | **CYP3A4**<br>*1A/*1B | Intermediate Metabolizer |
| Neurology | **Antimigraine Agents:** | | | | |
| | Zolmitriptan (Zomig®) | ○ | ✓ NORMAL RESPONSE EXPECTED | **CYP1A2**<br>*1A/*1F | Normal Metabolizer |
| Neurology | **Central Monoamine-Depleting Agents:** | | | | |
| | Tetrabenazine (Xenazine®) | ● | ✓ NORMAL RESPONSE EXPECTED | **CYP2D6**<br>*4/*10 | Intermediate Metabolizer |
| Neurology | **COMT Inhibitors:** | | | | |
| | Entacapone (Comtan®) | ◖ | ✓ NORMAL RESPONSE EXPECTED | **COMT**<br>WT/WT | Non MET Homozygous |
| Neurology | **NMDA Receptor Antagonists:** | | | | |
| | Dextromethorphan/Quinidine (Nuedexta®) | ● | ✓ NORMAL RESPONSE EXPECTED | **CYP2D6**<br>*4/*10 | Intermediate Metabolizer |

| Therapeutic | Drug Impacted | Evidence Level | Clinical Interpretation | Gene/Genotype | Phenotype |
|---|---|---|---|---|---|
| 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 | **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®)<br>Granisetron (Sancuso®) | ◖<br>◖ | NORMAL RESPONSE EXPECTED | **CYP2D6** *4/*10 | Intermediate Metabolizer |
| Oncology | **Antiemetics (Selective 5-HT3 Receptor Antagonist):** | | | | |
| | Dolasetron (Anzemet®)<br>Granisetron (Sancuso®) | ◖<br>◖ | 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 |

| Therapeutic | Drug Impacted | Evidence Level | Clinical Interpretation | Gene/Genotype | Phenotype |
|---|---|---|---|---|---|
| Oncology | **Antiemetics (Selective 5-HT3 Receptor Antagonist):** | | | | |
| | Ondansetron (Zofran®) | ◖ | ✓ NORMAL RESPONSE EXPECTED | **CYP2D6** *4/*10 | Intermediate Metabolizer |
| Oncology | **Antiemetics (Selective 5-HT3 Receptor Antagonist):** | | | | |
| | Palonosetron (Aloxi®) | ● | ✓ NORMAL RESPONSE EXPECTED | **CYP2D6** *4/*10 | Intermediate Metabolizer |
| Oncology | **Antimetabolites (Purine Analog):** | | | | |
| | Mercaptopurine (Purinethol®)<br>Thioguanine (Tabloid®) | ●<br>● | ✓ 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 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 |

| Therapeutic | Drug Impacted | Evidence Level | Clinical Interpretation | Gene/Genotype | Phenotype |
|---|---|---|---|---|---|
| Oncology | **Antimetabolites (Pyrimidine Analog):** | | | | |
| | Capecitabine (Xeloda®)<br>Pyrimidinedione (Tegafur-Uracil®) | ● | NORMAL RESPONSE EXPECTED | **DPYD**<br>*5/*9A/c.496A>G/IVS10-15T>C | Normal Metabolizer |
| Oncology | **Antimetabolites (Pyrimidine Analog):** | | | | |
| | Cytarabine (Depocyt®) | ◖ | NORMAL RESPONSE EXPECTED | **CDA**<br>WT/WT | rs532545 C Allele |
| Oncology | **BCR-ABL Tyrosine Kinase Inhibitors:** | | | | |
| | Nilotinib (Tasigna®)<br>Pazopanib (Votrient®) | ● | NORMAL RESPONSE EXPECTED | **UGT1A1**<br>*1/*28 | Heterozygous *28 Allele Carrier |
| Oncology | **BRAF Kinase Inhibitors:** | | | | |
| | Dabrafenib (Tafinlar®) | ● | USE CAUTION<br>by closely observing patients with G6PD deficiency for signs of hemolytic anemia | **G6PD**<br>WT/Mediterranean | G6PD Deficiency |
| Oncology | **Chemotherapy Modulating Agents:** | | | | |
| | Leucovorin (Wellcovorin®) | ◖ | USE CAUTION<br>due to an increased risk for nephrotoxicity, decreased survival and a poorer response | **ERCC1**<br>WT/WT | rs3212986 C Allele Carrier/rs11615 AA genotype/rs735482 AA genotype |
| Oncology | **Chemotherapy Modulating Agents:** | | | | |
| | Leucovorin (Wellcovorin®) | ○ | USE CAUTION<br>due to a highly increased risk of toxicity and poorer treatment outcome | **GSTP1**<br>WT/WT | rs1695 AA genotype |
| Oncology | **Chemotherapy Modulating Agents:** | | | | |
| | Leucovorin (Wellcovorin®) | ◖ | USE CAUTION<br>due to poorer response and increased risk of toxicity | **MTHFR**<br>C677T/C677T/A1298C | A1298C Heterozygous Mutation/C677T Homozygous Mutation |
| Oncology | **Chemotherapy Modulating Agents:** | | | | |
| | Leucovorin (Wellcovorin®) | ○ | USE CAUTION<br>due to decreased survival and response | **XRCC1**<br>WT/WT | rs25487 T Allele Carrier |
| Oncology | **EGFR Tyrosine Kinase Inhibitors:** | | | | |
| | Erlotinib (Tarceva®) | ◖ | NORMAL RESPONSE EXPECTED | **UGT1A1**<br>*1/*28 | Heterozygous *28 Allele Carrier |

| Therapeutic | Drug Impacted | Evidence Level | Clinical Interpretation | Gene/Genotype | Phenotype |
|---|---|---|---|---|---|
| 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 |
| 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 | **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®)<br>Cisplatin (Platinol®)<br>Oxaliplatin (Eloxatin®) | ◖<br>◖<br>◖ | ! 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®)<br>Cisplatin (Platinol®)<br>Oxaliplatin (Eloxatin®) | ◖<br>◖<br>◖ | ! USE CAUTION due to a highly increased risk of toxicity and poorer treatment outcome | **GSTP1** WT/WT | rs1695 AA genotype |

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| Therapeutic | Drug Impacted | Evidence Level | Clinical Interpretation | Gene/Genotype | Phenotype |
|---|---|---|---|---|---|
| Oncology | **Platinum Analog:** | | | | |
| | Carboplatin (Paraplatin®)<br>Cisplatin (Platinol®)<br>Oxaliplatin (Eloxatin®) | ◖ | ⚠ USE CAUTION<br>due to decreased survival and response | **XRCC1**<br>WT/WT | rs25487 T Allele Carrier |
| Oncology | **Platinum Analog:** | | | | |
| | Carboplatin (Paraplatin®)<br>Oxaliplatin (Eloxatin®) | ◖ | ⚠ USE CAUTION<br>due to poorer response and increased risk of toxicity | **MTHFR**<br>C677T/C677T/A1298C | A1298C Heterozygous Mutation/C677T Homozygous Mutation |
| Oncology | **Platinum Analog:** | | | | |
| | Cisplatin (Platinol®)<br>Oxaliplatin (Eloxatin®) | ◖ | ⚠ USE CAUTION<br>due to worse outcome including overall survival and progression-free survival | **NQO1**<br>c.559C>T/c.559C>T | rs1800566 AA genotype |
| Oncology | **Platinum Analog:** | | | | |
| | Cisplatin (Platinol®) | ◖ | ⚠ USE CAUTION<br>due to increased risk for nephrotoxicity | **ERCC1**<br>WT/WT | rs3212986 C Allele Carrier/rs11615 AA genotype/rs735482 AA genotype |
| Oncology | **Selective Estrogen Receptor Modulators (SERMs):** | | | | |
| | Tamoxifen (Soltamox®) | ◖ | ✖ CONSIDER ALTERNATIVES<br>like aromatase inhibitor for postmenopausal women due to increased risk for relapse of breast cancer | **CYP2D6**<br>*4/*10 | Intermediate Metabolizer |
| Oncology | **Taxane Derivatives:** | | | | |
| | Docetaxel (Taxotere®) | ◖ | ⚠ USE CAUTION<br>due to increased risk for nephrotoxicity | **ERCC1**<br>WT/WT | rs3212986 C Allele Carrier/rs11615 AA genotype/rs735482 AA genotype |
| Oncology | **Taxane Derivatives:** | | | | |
| | Paclitaxel (Abraxane®) | ◖ | ⚠ USE CAUTION<br>due to increased risk for nephrotoxicity | **ERCC1**<br>WT/WT | rs3212986 C Allele Carrier/rs11615 AA genotype/rs735482 AA genotype |
| Oncology | **Taxane Derivatives:** | | | | |
| | Cabazitaxel (Jevtana®) | ◖ | ✓ NORMAL RESPONSE EXPECTED | **CYP3A4**<br>*1A/*1B | Intermediate Metabolizer |

| Therapeutic | Drug Impacted | Evidence Level | Clinical Interpretation | Gene/Genotype | Phenotype |
|---|---|---|---|---|---|
| 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 |
| 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 |

| Therapeutic | Drug Impacted | Evidence Level | Clinical Interpretation | Gene/Genotype | Phenotype |
|---|---|---|---|---|---|
| Pain Management | **Nonsteroidal Antiinflammatory Drugs (NSAIDs):** | | | | |
| | Celecoxib (Celebrex®)<br>Diclofenac (Voltaren®)<br>Meloxicam (Mobic®) | ● | ✓ NORMAL RESPONSE EXPECTED | **CYP2C9** *1/*1 | Normal Metabolizer |
| Pain Management | **Nonsteroidal Antiinflammatory Drugs (NSAIDs):** | | | | |
| | Ibuprofen (Advil®)<br>Naproxen (Aleve®) | ○ | ✓ NORMAL RESPONSE EXPECTED | **CYP2C9** *1/*1 | Normal Metabolizer |
| Pain Management | **Nonsteroidal Antiinflammatory Drugs (NSAIDs):** | | | | |
| | Piroxicam (Feldene®) | ● | ✓ NORMAL RESPONSE EXPECTED | **CYP2C9** *1/*1 | Normal Metabolizer |
| Pain Management | **Opioids:** | | | | |
| | Codeine (Codeine®)<br>Codeine/Acetaminophen (Tylenol #3 & #4®)<br>Hydrocodone/Acetaminophen (Vicodin®)<br>Oxycodone (Oxycontin®) | ◖ | ✗ CONSIDER ALTERNATIVES<br>if no response | **CYP2D6** *4/*10 | Intermediate Metabolizer |
| Pain Management | **Opioids:** | | | | |
| | Tramadol Hydrochloride/Acetaminophen (Ultracet®)<br>Tramadol (Ultram®) | ● | ✗ CONSIDER ALTERNATIVES<br>(not oxycodone, codeine)<br>OR<br>▲ INCREASE DOSE | **CYP2D6** *4/*10 | Intermediate Metabolizer |
| Pain Management | **Opioids:** | | | | |
| | Methadone (Methadose®) | ◖ | ▼ DECREASE DOSE | **CYP2B6** G516T/G516T/A785G/A785G | G516T Homozygous/A785G Homozygous |

| Therapeutic | Drug Impacted | Evidence Level | Clinical Interpretation | Gene/Genotype | Phenotype |
|---|---|---|---|---|---|
| Pain Management | **Opioids:** | | | | |
| | Buprenorphine (Subutex®)<br>Fentanyl (Duragesic®)<br>Sufentanil (Sufenta®) | ○ | DECREASE DOSE<br>OR<br>USE CAUTION<br>due to the risk of increased exposure to the drug leading to adverse events | **CYP3A4**<br>*1A/*1B | Intermediate Metabolizer |
| Pain Management | **Opioids:** | | | | |
| | Alfentanil (Alfenta®)<br>Hydromorphone (Dilaudid®)<br>Morphine (MS Contin®) | ◖<br>○<br>◖ | NORMAL RESPONSE EXPECTED | **OPRM1**<br>WT/WT | rs1799971 A Allele Carrier/rs510679 TT genotype |
| Pain Management | **Skeletal Muscle Relaxants:** | | | | |
| | Carisoprodol (Soma®) | ◖ | NORMAL RESPONSE EXPECTED | **CYP2C19**<br>*1/*2 | Intermediate Metabolizer |
| Pain Management | **Skeletal Muscle Relaxants:** | | | | |
| | Cyclobenzaprine (Flexeril®) | ○ | NORMAL RESPONSE EXPECTED | **CYP1A2**<br>*1A/*1F | Normal Metabolizer |
| Psychiatry | **Aldehyde Dehydrogenase Inhibitors:** | | | | |
| | Disulfiram (Antabuse®) | ◖ | NORMAL DOSE<br>may have an increased likelihood of response | **ANKK1**<br>WT/c.2137G>A | A1 Heterozygous |
| Psychiatry | **Alpha-2 Antagonists:** | | | | |
| | Mirtazapine (Remeron®) | ◖ | USE CAUTION<br>due to possible increased ADRs | **CYP2D6**<br>*4/*10 | Intermediate Metabolizer |
| Psychiatry | **Anti-Anxiety Agents:** | | | | |
| | Buspirone (Buspar®) | ○ | NORMAL RESPONSE EXPECTED | **HTR1A**<br>WT/WT | rs6295 CC genotype/rs1800044 C Allele Carrier |
| Psychiatry | **Antimanic Agents:** | | | | |
| | Lithium (Lithobid®) | ◖ | USE CAUTION<br>due to possible less drug response | **ABCB1**<br>WT/WT | rs2032582 AA genotype/rs1045642 AA genotype |

| 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 | **Antipsychotics:** | | | | |
| | Chlorpromazine<br>Fluphenazine | ◖<br>◖ | **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 |
| Psychiatry | **Antipsychotics:** | | | | |
| | Olanzapine (Zyprexa®)<br>Quetiapine (Seroquel®) | ◖<br>◖ | **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 |

| Therapeutic | Drug Impacted | Evidence Level | Clinical Interpretation | Gene/Genotype | Phenotype |
|---|---|---|---|---|---|
| Psychiatry | **Antipsychotics:** | | | | |
| | Aripiprazole (Abilify®)<br>Brexpiprazole (Rexulti®)<br>Iloperidone (Fanapt®)<br>Pimozide (Orap®) | ● | ✓ NORMAL RESPONSE EXPECTED | **CYP2D6**<br>*4/*10 | Intermediate Metabolizer |
| Psychiatry | **Antipsychotics:** | | | | |
| | Aripiprazole (Abilify®) | ◖ | ✓ NORMAL RESPONSE EXPECTED | **CYP3A4**<br>*1A/*1B | Intermediate Metabolizer |
| Psychiatry | **Antipsychotics:** | | | | |
| | Haloperidol (Haldol®) | ◖ | ✓ NORMAL RESPONSE EXPECTED | **CYP2D6**<br>*4/*10 | Intermediate Metabolizer |
| Psychiatry | **Antipsychotics:** | | | | |
| | Perphenazine | ● | ✓ NORMAL RESPONSE EXPECTED | **CYP2D6**<br>*4/*10 | Intermediate Metabolizer |
| Psychiatry | **Benzodiazepines:** | | | | |
| | Diazepam (Valium®) | ● | ! USE CAUTION<br>due to possible increased ADRs | **CYP2C19**<br>*1/*2 | Intermediate Metabolizer |
| Psychiatry | **Benzodiazepines:** | | | | |
| | Alprazolam (Xanax®) | ○ | ✓ NORMAL RESPONSE EXPECTED | **CYP3A4**<br>*1A/*1B | Intermediate Metabolizer |
| Psychiatry | **Benzodiazepines:** | | | | |
| | Lorazepam (Ativan®)<br>Oxazepam (Serax®) | ◖ | ✓ NORMAL RESPONSE EXPECTED | **UGT2B15**<br>*1/*2 | rs1902023 non-AA genotype |
| Psychiatry | **Benzodiazepines:** | | | | |
| | Midazolam (Versed®) | ◖ | ✓ NORMAL RESPONSE EXPECTED | **CYP3A5**<br>*1A/*3A | Expresser |
| Psychiatry | **CNS Stimulants (ADHD):** | | | | |
| | Amphetamine/Dextroamphetamine (Adderall®)<br>Dextroamphetamine (Dexedrine®)<br>Methylphenidate (Ritalin®) | ◖ | ! USE CAUTION<br>due to increased severity of social withdrawal | **DRD1**<br>WT/WT | rs4532 CC genotype |

| Therapeutic | Drug Impacted | Evidence Level | Clinical Interpretation | Gene/Genotype | Phenotype |
|---|---|---|---|---|---|
| Psychiatry | **CNS Stimulants (ADHD):** | | | | |
| | Dexmethylphenidate (Focalin®)<br>Lisdexamfetamine (Vyvanse®) | ◖<br>○ | ✓ NORMAL RESPONSE EXPECTED | **COMT**<br>WT/WT | Non MET Homozygous |
| Psychiatry | **CNS Stimulants (ADHD):** | | | | |
| | Methamphetamine (Desoxyn®) | ◖ | ✓ NORMAL RESPONSE EXPECTED | **FAAH**<br>WT/WT | rs324420 CC genotype |
| Psychiatry | **Dopamine/Norepinephrine-Reuptake Inhibitors:** | | | | |
| | Bupropion (Wellbutrin®) | ◖ | ! USE CAUTION<br>due to reduced response and increased risk of side effects | **CYP2B6**<br>G516T/G516T/A785G/A785G | G516T Homozygous/A785G Homozygous |
| Psychiatry | **Dopamine/Norepinephrine-Reuptake Inhibitors:** | | | | |
| | Bupropion (Wellbutrin®) | ◖ | ! USE CAUTION<br>due to reduced response and increased risk of side effects | **CYP2C19**<br>*1/*2 | Intermediate Metabolizer |
| Psychiatry | **Opioids Antagonists:** | | | | |
| | Naloxone (Evzio®)<br>Naltrexone (Revia®) | ◖<br>◖ | ✓ NORMAL RESPONSE EXPECTED | **OPRM1**<br>WT/WT | rs1799971 A Allele Carrier/rs510679 TT genotype |
| Psychiatry | **Other Stimulants:** | | | | |
| | Cannabinoids | ◖ | ! USE CAUTION<br>due to increased risk of tetrahydrocannabinol (THC) dependence | **FAAH**<br>WT/WT | rs324420 CC genotype |
| Psychiatry | **Other Stimulants:** | | | | |
| | Cocaine | ◖ | ✓ NORMAL RESPONSE EXPECTED | **CNR1**<br>c.*3475A>G/c.*3475A>G | rs806368 non-TT genotype |
| Psychiatry | **Selective Serotonin Reuptake Inhibitors (SSRIs):** | | | | |
| | Citalopram (Celexa®) | ◖ | ! USE CAUTION<br>due to reduced response | **GRIK4**<br>WT/WT | rs1954787 T Allele Carrier |
| Psychiatry | **Selective Serotonin Reuptake Inhibitors (SSRIs):** | | | | |
| | Fluoxetine (Prozac®) | ● | ! USE CAUTION<br>due to elevated risk for drug overdose resulting in adverse events and drug interaction | **CYP2D6**<br>*4/*10 | Intermediate Metabolizer |

| Therapeutic | Drug Impacted | Evidence Level | Clinical Interpretation | Gene/Genotype | Phenotype |
|---|---|---|---|---|---|
| Psychiatry | **Selective Serotonin Reuptake Inhibitors (SSRIs):** | | | | |
| | Fluvoxamine (Luvox®)<br>Paroxetine (Paxil®)<br>Sertraline (Zoloft®) | ◖ | ⚠ USE CAUTION<br>due to reduced response | **HTR1A**<br>WT/WT | rs6295 CC genotype/rs1800044 C Allele Carrier |
| Psychiatry | **Selective Serotonin Reuptake Inhibitors (SSRIs):** | | | | |
| | Sertraline (Zoloft®) | ◖ | ⚠ USE CAUTION<br>with high alert to adverse drug events | **CYP2C19**<br>*1/*2 | Intermediate Metabolizer |
| Psychiatry | **Selective Serotonin Reuptake Inhibitors (SSRIs):** | | | | |
| | Escitalopram (Lexapro®) | ● | ✓ NORMAL RESPONSE EXPECTED | **CYP2C19**<br>*1/*2 | Intermediate Metabolizer |
| Psychiatry | **Selective Serotonin Reuptake Inhibitors (SSRIs):** | | | | |
| | Escitalopram (Lexapro®) | ◖ | ✓ NORMAL RESPONSE EXPECTED | **SLC6A4**<br>LA/LA | HTTLPR Long Form |
| Psychiatry | **Selective Serotonin Reuptake Inhibitors (SSRIs):** | | | | |
| | Vilazodone (Viibryd®) | ○ | ✓ NORMAL RESPONSE EXPECTED | **CYP3A4**<br>*1A/*1B | Intermediate Metabolizer |
| Psychiatry | **Selective Serotonin Reuptake Inhibitors (SSRIs):** | | | | |
| | Vortioxetine (Trintellix®) | ● | ✓ NORMAL RESPONSE EXPECTED | **CYP2D6**<br>*4/*10 | Intermediate Metabolizer |
| Psychiatry | **Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs):** | | | | |
| | Venlafaxine (Effexor®) | ● | ✗ CONSIDER ALTERNATIVES<br>(e.g., citalopram, sertraline) | **CYP2D6**<br>*4/*10 | Intermediate Metabolizer |
| Psychiatry | **Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs):** | | | | |
| | Milnacipran (Savella®) | ◖ | ⚠ USE CAUTION<br>due to reduced response | **ADRA2A**<br>WT/c.-217G>A | rs1800544 GG genotype/rs1800545 GA genotype |

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| Therapeutic | Drug Impacted | Evidence Level | Clinical Interpretation | Gene/Genotype | Phenotype |
|---|---|---|---|---|---|
| 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 |
| Psychiatry | **Tetracyclic Antidepressants:** | | | | |
| | Maprotiline | ◖ | DECREASE DOSE | **CYP2D6** *4/*10 | Intermediate Metabolizer |
| Psychiatry | **Tricyclic Antidepressants:** | | | | |
| | Amitriptyline (Elavil®) | ● | DECREASE DOSE by 25% | **CYP2D6** *4/*10 | Intermediate Metabolizer |
| | Clomipramine (Anafranil®) | ● | | | |
| | Doxepin (Silenor®) | ● | | | |
| | Imipramine (Tofranil®) | ● | | | |
| | Protriptyline (Vivactil®) | ● | | | |
| | Trimipramine (Surmontil®) | ● | | | |

| Therapeutic | Drug Impacted | Evidence Level | Clinical Interpretation | Gene/Genotype | Phenotype |
|---|---|---|---|---|---|
| Psychiatry | **Tricyclic Antidepressants:** | | | | |
| | Desipramine (Norpramin®)<br>Nortriptyline (Pamelor®) | ●<br>● | DECREASE DOSE<br>by 25% | **CYP2D6**<br>*4/*10 | Intermediate Metabolizer |
| Rheumatology | **Nonsteroidal Antiinflammatory Drugs (NSAIDs):** | | | | |
| | Flurbiprofen (Ansaid®) | ● | NORMAL RESPONSE EXPECTED | **CYP2C9**<br>*1/*1 | Normal Metabolizer |
| Smoking Cessation | **Smoking Cessation Aids:** | | | | |
| | Bupropion (Zyban®) | ◖ | USE CAUTION<br>due to reduced effectiveness | **ANKK1**<br>WT/c.2137G>A | A1 Heterozygous |
| Smoking Cessation | **Smoking Cessation Aids:** | | | | |
| | Nicotine (Nicoderm®) | ◖ | NORMAL RESPONSE EXPECTED | **COMT**<br>WT/WT | Non MET Homozygous |
| Supplements | **Vitamins:** | | | | |
| | Folic Acid | ◖ | CONSIDER ALTERNATIVES<br>(e.g., supplements containing methylfolate) due to significantly reduced folic acid conversion | **MTHFR**<br>C677T/C677T/A1298C | A1298C Heterozygous Mutation/C677T Homozygous Mutation |
| Toxicology | **Antidotes:** | | | | |
| | Sodium Nitrite | ● | CONSIDER ALTERNATIVES | **G6PD**<br>WT/Mediterranean | G6PD Deficiency |
| Toxicology | **Antidotes:** | | | | |
| | Ethanol | ◖ | USE CAUTION<br>due to increased risk for alcoholism | **ANKK1**<br>WT/c.2137G>A | A1 Heterozygous |
| Toxicology | **Antidotes:** | | | | |
| | Methylene Blue (Provayblue®) | ● | USE CAUTION<br>due to risk of hemolytic anemia | **G6PD**<br>WT/Mediterranean | G6PD Deficiency |

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| Therapeutic | Drug Impacted | Evidence Level | Clinical Interpretation | Gene/Genotype | Phenotype |
|---|---|---|---|---|---|
| Urology | **Alpha 1 Blockers:** | | | | |
| | Dutasteride/Tamsulosin (Jalyn®)<br>Tamsulosin (Flomax®) | ●<br>● | ✓ NORMAL RESPONSE EXPECTED | **CYP2D6**<br>*4/*10 | Intermediate Metabolizer |
| Urology | **Alpha 1 Blockers:** | | | | |
| | Silodosin (Rapaflo®) | ○ | ✓ NORMAL RESPONSE EXPECTED | **CYP3A4**<br>*1A/*1B | Intermediate Metabolizer |
| Urology | **Anticholinergic Agents:** | | | | |
| | Darifenacin (Enablex®)<br>Fesoterodine (Toviaz®) | ●<br>● | ✓ NORMAL RESPONSE EXPECTED | **CYP2D6**<br>*4/*10 | Intermediate Metabolizer |
| Urology | **Anticholinergic Agents:** | | | | |
| | Tolterodine (Detrol®) | ● | ✓ NORMAL RESPONSE EXPECTED | **CYP2D6**<br>*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 | C677T/C677T/A1298C | A1298C Heterozygous Mutation/C677T Homozygous Mutation |
| 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 |

| Gene | Genotype | Phenotype |
|---|---|---|
| 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, Mediterran ean, 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