RightMed® comprehensive test report

The RightMed comprehensive test is a pharmacogenomic test that identifies how a patient's DNA affects their response to hundreds of medications. This report can be used to help determine safer, more effective medications and doses tailored to a patient's genomic profile.

Patient and report summary

Patient name: **Jane Doe**
Patient date of birth: **1972-07-08**
OneOme report date: **2019-01-09**

Ordering provider: **Sample Doctor**
Ordering facility: **Healthcare Institution**
Product type: **Comprehensive**
Report type: **Original**

Report legend

Based on this patient's genetic profile, medications are reported according to genotype-predicted interactions described below.

Major gene-drug interaction	Major genotype-drug interaction identified that affects the metabolism of the medication and/or indicates an elevated risk of adverse reaction or loss of efficacy.
Moderate gene-drug interaction	Moderate genotype-drug interaction identified that affects the metabolism of the medication and/or indicates an elevated risk of adverse reaction or loss of efficacy.
Minimal gene-drug interaction	Minimal genotype-drug interaction identified that does not significantly impact medication metabolism or predict an elevated risk of adverse reaction or loss of efficacy.
Limited pharmacogenetic impact	Not significantly affected by pharmacogenetic variants associated with medication response. Other types of genetic tests that may guide prescribing (e.g., tumor marker testing, diagnostic, or indication-establishing testing) are not taken into account.

Icon legend

Some medications are reported with icons to indicate that specific clinical annotations and/or dosing guidelines provided by FDA, CPIC, or other professional associations are available in the RightMed Advisor.

Increased exposure	Total exposure to active compound(s) may be increased. Monitor for adverse effects.
Decreased exposure	Total exposure to active compound(s) may be decreased. Monitor for lack of therapeutic response.
Difficult to predict	Total exposure to active compound(s) is difficult to predict. Monitor patient response.
Reduced response	Response to medication may be lowered due to genetic changes impacting mechanisms other than exposure (e.g. receptor function).
Additional testing	According to FDA labeling, additional laboratory testing may be indicated.
Professional guideline	Medication has professional guidelines associated with this patient's genetic test results. Avoidance, dose adjustment, or heightened monitoring may be indicated.

Personalized medication report summary

This list was generated from the medications entered during the order process. Providers can find more information about each medication in the *Personalized medication report* or in the RightMed Advisor.

Note: The associated genes listed for each medication do not imply that a specific gene-drug interaction exists, as some genes may only be informative in nature.

Medication	PGx result	Overview	Associated gene(s)
Carbamazepine (Carbatrol, Tegretol)	Major gene-drug interaction	→ Normal metabolism of carbamazepine predicted. ☑ Normal exposure to carbamazepine predicted. • Negative for the presence of the HLA-B*15:02 allele. • Increased risk of hypersensitivity reactions related to HLA-A*31:01 genotype. 📖 Professional guidelines exist for the use of carbamazepine in patients with this genotype and/or phenotype.	CYP3A5 HLA-A HLA-B
Citalopram (Celexa)	Major gene-drug interaction	↑ Increased metabolism of citalopram predicted. ⊟ Decreased exposure to citalopram predicted. • Typical to increased expression of the SLC6A4 transporter. 📖 Professional guidelines exist for the use of citalopram in patients with this genotype and/or phenotype.	CYP2C19 GRIK4 HTR2A SLC6A4
Phenytoin (Dilantin)	Major gene-drug interaction	↓ Reduced metabolism of phenytoin predicted. ⊞ Increased exposure to phenytoin predicted. • Negative for the presence of the HLA-B*15:02 allele. • Increased risk of hypersensitivity reactions related to HLA-A*31:01 genotype. 📖 Professional guidelines exist for the use of phenytoin in patients with this genotype and/or phenotype.	CYP2C9 HLA-A HLA-B
Bupropion (Wellbutrin)	Minimal gene-drug interaction	→ Normal metabolism of bupropion predicted. ☑ Normal exposure to bupropion predicted. • Allele(s) have demonstrated substrate-specific function with bupropion, therefore cytochrome P450 phenotype may differ from bupropion-specific phenotype.	CYP2B6
Fluoxetine (Prozac, Sarafem)	Minimal gene-drug interaction	☑ Genotype suggests a normal exposure to fluoxetine. • Typical to increased expression of the SLC6A4 transporter.	CYP2C9 CYP2D6 SLC6A4

Genotype-predicted interactions for medications

Allergy/Pulmonology

Major gene-drug interaction

Moderate gene-drug interaction

Minimal gene-drug interaction

- Dextromethorphan 1 (Delsym®)
- Indacaterol 1, 78 (Arcapta®)
- Loratadine 229 (Claritin®)
- Salmeterol 1 (Serevent®)
- Sildenafil 1 (Revatio®, Viagra®)
- Tadalafil 1 (Adcirca®, Cialis®)

Limited pharmacogenetic impact

- Montelukast (Singulair®)

Analgesic/Anesthesiology

Major gene-drug interaction

- Morphine 14, 20, 25, 26, 100, 106, 167, 183, 184, 197 (Kadian®, MS Contin®)

Moderate gene-drug interaction

- Alfentanil 1, 46, 89, 99, 142, 154 (Alfenta®)
- Carisoprodol 1, 49 (Soma®)
- Fentanyl 1, 44, 53, 69, 92, 102, 198, 223, 228, 234, 235, 236 (Duragesic®, Sublimaze®)
- Ketamine 1, 108, 109, 161, 225 (Ketalar®)

Minimal gene-drug interaction

- Buprenorphine 1 (Buprenex®, BuTrans®, Subutex®)
- Codeine 1, 2, 9, 20, 34, 35, 185, 199
- Cyclobenzaprine 1, 217 (Flexeril®)
- Hydrocodone 1, 34, 35 (Hysingla®, Zohydro®)
- Methadone 1 (Dolophine®, Methadose®)
- Midazolam 1, 204 (Versed®)
- Oxycodone 1, 34, 35 (Oxycontin®, Roxicodone®)
- Tramadol 1, 2, 34, 35, 113, 189, 192, 205 (Ultram®)

Limited pharmacogenetic impact

- Naloxone (Evzio®, Narcan®)

Anti-inflammatory

Major gene-drug interaction

Moderate gene-drug interaction

- Celecoxib 1 (Celebrex®)
- Diclofenac 1 (Voltaren®)
- Flurbiprofen 1, 193 (Ansaid®)

Minimal gene-drug interaction

Limited pharmacogenetic impact

Anti-inflammatory (cont.)

Major gene-drug interaction	Moderate gene-drug interaction	Minimal gene-drug interaction	Limited pharmacogenetic impact
	▪ Meloxicam + 1 (Mobic®) ▪ Piroxicam + 1 (Feldene®)		

Anticoagulant/Antiplatelet

Major gene-drug interaction	Moderate gene-drug interaction	Minimal gene-drug interaction	Limited pharmacogenetic impact
	▪ Clopidogrel + 1, 175, 176 (Plavix®) ▪ Warfarin 1, 23, 75, 76 (Coumadin®, Jantoven®)	▪ Apixaban 1 (Eliquis®) ▪ Cilostazol 1, 204 (Pletal®) ▪ Ticagrelor 1 (Brilinta®)	▪ Dalteparin (Fragmin®) ▪ Enoxaparin (Lovenox®) ▪ Prasugrel (Effient®) ▪ Tirofiban (Aggrastat®)

Cardiovascular

Major gene-drug interaction	Moderate gene-drug interaction	Minimal gene-drug interaction	Limited pharmacogenetic impact
▪ Labetalol − 24 (Trandate®)	▪ Azilsartan + 1 (Edarbi®) ▪ Fluvastatin + 1 (Lescol®) ▪ Guanabenz − 32 (Wytensin®) ▪ Irbesartan + 1 (Avapro®) ▪ Losartan + 1 (Cozaar®)	▪ Aliskiren 1 (Tekturna®) ▪ Amiodarone 1 (Cordarone®, Pacerone®) ▪ Amlodipine 1 (Norvasc®) ▪ Atorvastatin 1 (Lipitor®) ▪ Carvedilol 1 (Coreg®) ▪ Clonidine 1 (Catapres®, Kapvay®) ▪ Diltiazem 1, 204 (Cardizem®, Cartia®) ▪ Disopyramide 1 (Norpace®) ▪ Dofetilide 1 (Tikosyn®) ▪ Dronedarone 1, 204 (Multaq®) ▪ Eplerenone 1 (Inspra®) ▪ Felodipine 1 (Plendil®) ▪ Flecainide 1, 2 (Tambocor®)	▪ Alirocumab (Praluent®) ▪ Colesevelam (Welchol®) ▪ Digoxin (Digitek®, Digox®, Lanoxin®) ▪ Gemfibrozil (Lopid®) ▪ Lisinopril (Prinivil®, Zestril®) ▪ Nitroglycerin (Minitran®, Nitrostat®) ▪ Sotalol (Betapace®, Sorine®) ▪ Spironolactone (Aldactone®) ▪ Telmisartan (Micardis®)

Cardiovascular (cont.)

Major gene-drug interaction

Moderate gene-drug interaction

Minimal gene-drug interaction

- Lidocaine 38, 145
  (Xylocaine®)
- Lomitapide 1
  (Juxtapid®)
- Lovastatin 1
  (Mevacor®)
- Metoprolol 1, 2
  (Lopressor®, Toprol XL®)
- Nifedipine 1, 204
  (Adalat®, Nifedical®, Procardia®)
- Nisoldipine 1, 204
  (Sular®)
- Pravastatin 1, 137
  (Pravachol®)
- Propafenone 1, 2
  (Rythmol®)
- Propranolol 1
  (Inderal®)
- Quinidine 1
  (Quin-G®)
- Ranolazine 1
  (Ranexa®)
- Simvastatin 1, 97, 159, 177, 204, 219
  (Zocor®)
- Timolol 211
  (Blocadren®)
- Verapamil 1, 204
  (Calan®, Verelan®)

Limited pharmacogenetic impact

Endocrinology

Major gene-drug interaction

Moderate gene-drug interaction

- Chlorpropamide + 1, 182
- Glimepiride + 1
  (Amaryl®)
- Glipizide + 1, 90, 95, 201
  (Glucotrol®)
- Glyburide + 1
  (Diabeta®, Micronase®)
- Nateglinide + 1
  (Starlix®)
- Tolbutamide + 2

Minimal gene-drug interaction

- Ethinyl estradiol 1, 2

Limited pharmacogenetic impact

- Ibandronate
  (Boniva®)
- Insulin aspart
  (Novolog®)
- Insulin aspart protamine/ Insulin aspart
  (Novolog mix®)
- Insulin aspart/Insulin degludec
  (Ryzodeg 70/30®)
- Insulin degludec
  (Tresiba®)
- Insulin detemir
  (Levemir®)
- Insulin glargine
  (Lantus®, Toujeo®)

Endocrinology (cont.)

Major gene-drug interaction	Moderate gene-drug interaction	Minimal gene-drug interaction	Limited pharmacogenetic impact
			▪ Insulin glulisine (Apidra®) ▪ Insulin lispro (Humalog®) ▪ Insulin lispro protamine/ Insulin lispro (Humalog mix®) ▪ Insulin NPH (Humulin N®, Novolin N®) ▪ Insulin NPH/Insulin regular (Humulin 70/30®, Novolin 70/ 30®) ▪ Insulin regular (Humulin R®, Novolin R®) ▪ Insulin regular (oral inhalation) (Afrezza®) ▪ Levothyroxine (Levoxyl®, Synthroid®) ▪ Metformin (Fortamet®, Glucophage®) ▪ Pamidronate (Aredia®) ▪ Risedronate (Actonel®, Atelvia®) ▪ Vasopressin (Vasostrict®)

Gastroenterology

Major gene-drug interaction	Moderate gene-drug interaction	Minimal gene-drug interaction	Limited pharmacogenetic impact
▪ Esomeprazole [-] 1, 2 (Nexium®) ▪ Lansoprazole [-] 1, 2, 134 (Prevacid®) ▪ Omeprazole [-] 1, 2 (Prilosec®) ▪ Pantoprazole [-] 1 (Protonix®)	▪ Dexlansoprazole [-] 1 (Dexilant®) ▪ Dronabinol [+] 1 (Marinol®, Syndros®) ▪ Rabeprazole [-] 1 (Aciphex®)	▪ Aprepitant 1, 127 (Cinvanti®, Emend®) ▪ Dolasetron 1 (Anzemet®) ▪ Fosaprepitant 1, 127 (Emend Injection®) ▪ Ondansetron 1, 15, 79, 207 (Zofran®)	

Genetic disease

Major gene-drug interaction	Moderate gene-drug interaction	Minimal gene-drug interaction	Limited pharmacogenetic impact
		▪ Eliglustat 1 (Cerdelga®)	▪ Sapropterin (Kuvan®)

Genetic disease (cont.)

Major gene-drug interaction

Moderate gene-drug interaction

Minimal gene-drug interaction

- Ivacaftor 1 (Kalydeco®)

Limited pharmacogenetic impact

- Sodium phenylbutyrate (Buphenyl®)
- Velaglucerase alfa 1 (Vpriv®)

Hematology/Oncology

Major gene-drug interaction

- Mercaptopurine 1, 2, 164, 165 (Purixan®)
- Thioguanine 1, 2, 164, 165 (Tabloid®)

Moderate gene-drug interaction

- Bortezomib 1 (Velcade®)

Minimal gene-drug interaction

- Axitinib 1 (Inlyta®)
- Belinostat 1, 216 (Beleodaq®)
- Bosutinib 1 (Bosulif®)
- Brentuximab vedotin 1 (Adcetris®)
- Cabazitaxel 1 (Jevtana®)
- Capecitabine 1, 2, 22 (Xeloda®)
- Crizotinib 1 (Xalkori®)
- Dasatinib 1 (Sprycel®)
- Docetaxel 1 (Docefrez®, Taxotere®)
- Enzalutamide 1 (Xtandi®)
- Erlotinib 1, 73 (Tarceva®)
- Etoposide 1, 238 (Toposar®)
- Everolimus 1, 204 (Afinitor®, Zortress®)
- Exemestane 1 (Aromasin®)
- Fluorouracil 1, 2, 22 (Adrucil®)
- Gefitinib 1 (Iressa®)
- Ifosfamide 1, 27 (Ifex®)
- Imatinib 1 (Gleevec®)
- Irinotecan 1, 47, 96 (Camptosar®)

Limited pharmacogenetic impact

- Afatinib 1 (Gilotrif®)
- Alemtuzumab 1 (Campath®, Lemtrada®)
- Darbepoetin alfa (Aranesp®)
- Epoetin alfa (Epogen®, Procrit®)
- Ibritumomab 1 (Zevalin®)
- Obinutuzumab 1 (Gazyva®)
- Ofatumumab 1 (Arzerra®)
- Panitumumab 1 (Vectibix®)
- Pertuzumab 1 (Perjeta®)

Hematology/Oncology (cont.)

Major gene-drug interaction	Moderate gene-drug interaction	Minimal gene-drug interaction	Limited pharmacogenetic impact
		▪ Ixabepilone [1] (Ixempra®) ▪ Lapatinib [1, 174] (Tykerb®) ▪ Methotrexate [1, 158, 160, 203, 233] (Rheumatrex®) ▪ Nilotinib [1, 4] (Tasigna®) ▪ Paclitaxel [1] (Abraxane®) ▪ Pazopanib [1] (Votrient®) ▪ Ponatinib [1] (Iclusig®) ▪ Regorafenib [1] (Stivarga®) ▪ Ruxolitinib [1] (Jakafi®) ▪ Sorafenib [1] (Nexavar®) ▪ Sunitinib [1] (Sutent®) ▪ Tamoxifen [1, 2, 48] (Soltamox®) ▪ Temsirolimus [1] (Torisel®) ▪ Teniposide [98, 166] (Vumon®) ▪ Trabectedin [1] (Yondelis®) ▪ Vemurafenib [1] (Zelboraf®) ▪ Vincristine [1, 204] (Vincasar®) ▪ Vinorelbine [1] (Navelbine®)	

Immunosuppression

Major gene-drug interaction	Moderate gene-drug interaction	Minimal gene-drug interaction	Limited pharmacogenetic impact
▪ Azathioprine [1, 2, 110, 164, 165] (Imuran®)		▪ Cyclosporine [1] (Gengraf®, Neoral®, Sandimmune®) ▪ Everolimus [1, 204] (Afinitor®, Zortress®) ▪ Sirolimus [1] (Rapamune®)	▪ Mycophenolate sodium (Myfortic®)

Immunosuppression (cont.)

Major gene-drug interaction

Moderate gene-drug interaction

Minimal gene-drug interaction

- Tacrolimus 1, 16
  (Prograf®)

Limited pharmacogenetic impact

Infectious disease

Major gene-drug interaction

- Atovaquone/Proguanil + 1
  (Malarone®)
- Voriconazole − 1, 2
  (Vfend®)

Moderate gene-drug interaction

- Nelfinavir − 1
  (Viracept®)
- Peginterferon alfa-2a-containing regimens 1, 129
  (Pegasys®)
- Peginterferon alfa-2b-containing regimens 1, 129
  (Pegintron®)

Minimal gene-drug interaction

- Abacavir 1, 2, 43, 115, 116, 120, 121, 171, 195
  (Ziagen®)
- Atazanavir 45, 74
  (Reyataz®)
- Clarithromycin 1, 204
  (Biaxin®)
- Darunavir 1
  (Prezista®)
- Delavirdine 1
  (Rescriptor®)
- Efavirenz 1
  (Sustiva®)
- Erythromycin 204
  (E.E.S.®, Ery-Tab®)
- Fosamprenavir 1
  (Lexiva®)
- Indinavir 1, 204
  (Crixivan®)
- Isavuconazole 1
  (Cresemba®)
- Itraconazole 1
  (Onmel®, Sporanox®)
- Ivermectin 1, 232
  (Stromectol®)
- Ketoconazole 1
- Maraviroc 1
  (Selzentry®)
- Mefloquine 1
  (Lariam®)
- Nevirapine 1
  (Viramune®)
- Quinidine 1
  (Quin-G®)
- Quinine 1, 204
  (Qualaquin®)
- Ritonavir 1
  (Norvir®)
- Saquinavir 1, 204
  (Invirase®)
- Simeprevir 1
  (Olysio®)

Limited pharmacogenetic impact

- Atovaquone
  (Mepron®)
- Cefdinir
  (Omnicef®)
- Ceftriaxone
  (Rocephin®)
- Fluconazole
  (Diflucan®)
- Flucytosine
  (Ancobon®)
- Levofloxacin
  (Levaquin®)
- Meropenem
  (Merrem®)
- Moxifloxacin
  (Avelox®)
- Nystatin
  (Bio-Statin®)
- Piperacillin
  (Pipracil®)
- Posaconazole
  (Noxafil®)
- Vancomycin
  (Vancocin®)
- Zanamivir
  (Relenza®)

Infectious disease (cont.)

Major gene-drug interaction

Moderate gene-drug interaction

Minimal gene-drug interaction

- Telithromycin 1 (Ketek®)
- Terbinafine 1 (Lamisil®)
- Tipranavir 1 (Aptivus®)

Limited pharmacogenetic impact

Neurology

Major gene-drug interaction

- Brivaracetam 1 (Briviact®)
- Carbamazepine 1, 5, 6, 29, 30, 62, 105, 117, 125, 126, 138, 149, 153, 157, 178, 230 (Carbatrol®, Tegretol®)
- Clobazam 1 (Onfi®)
- Fosphenytoin 1, 2, 6, 21, 28, 117, 139 (Cerebyx®)
- Phenytoin 1, 2, 6, 21, 28, 117, 139 (Dilantin®)

Moderate gene-drug interaction

- Caffeine 1 (No Doz®, Vivarin®)
- Eslicarbazepine 1, 6, 81, 153 (Aptiom®)
- Frovatriptan 1 (Frova®)
- Lamotrigine 1, 6, 117, 153 (Lamictal®)
- Oxcarbazepine 1, 6, 153 (Trileptal®)
- Rasagiline 1 (Azilect®)
- Selegiline 58, 80, 173 (Eldepryl®, Emsam®)

Minimal gene-drug interaction

- Dextromethorphan/ Quinidine 1 (Nuedexta®)
- Donepezil 1 (Aricept®)
- Eletriptan 1 (Relpax®)
- Ethosuximide 10, 150 (Zarontin®)
- Tetrabenazine 1 (Xenazine®)
- Zonisamide 1 (Zonegran®)

Limited pharmacogenetic impact

- Gabapentin (Neurontin®)
- Levetiracetam (Keppra®)
- Memantine (Namenda®)
- Pramipexole (Mirapex®)
- Pregabalin (Lyrica®)
- Succimer (Chemet®)
- Vigabatrin (Sabril®)

Psychiatry

Major gene-drug interaction

- Amitriptyline 1, 2, 56, 57, 218 (Elavil®)
- Citalopram 1, 2, 7, 18, 41, 55, 59, 60, 61, 66, 85, 86, 101, 104, 107, 119, 124, 128, 136, 146, 152, 155, 222 (Celexa®)
- Clomipramine 1, 2, 57 (Anafranil®)
- Diazepam 1, 68 (Valium®)
- Doxepin 1, 2, 57 (Silenor®)
- Escitalopram 1, 2, 7, 18, 41, 55, 60, 61, 66, 101, 107, 119, 128, 136, 155, 222 (Lexapro®)
- Imipramine 1, 2, 57, 215 (Tofranil®)

Moderate gene-drug interaction

- Asenapine 1 (Saphris®)
- Clozapine 1, 8, 12, 194 (Clozaril®)
- Duloxetine 1 (Cymbalta®)
- Nicotine 33, 37, 77, 130 (Nicoderm C-Q®, Nicorette®, Nicotrol®)
- Olanzapine 1, 2, 103, 114 (Zydis®, Zyprexa®)
- Selegiline 58, 80, 173 (Eldepryl®, Emsam®)
- Sertraline 1, 2, 40, 42, 55, 111, 132, 135, 140, 163, 169, 206, 214 (Zoloft®)

Minimal gene-drug interaction

- Alprazolam 1, 204 (Xanax®)
- Amphetamine/ Dextroamphetamine mixed salts 1, 52, 65, 123 (Adderall®)
- Aripiprazole 1, 2 (Abilify®)
- Atomoxetine 1, 2 (Strattera®)
- Brexpiprazole 1 (Rexulti®)
- Bupropion 1 (Wellbutrin®)
- Buspirone 1, 204, 237 (Buspar®)
- Cariprazine 1, 3, 19, 31, 133 (Vraylar®)

Limited pharmacogenetic impact

- Desvenlafaxine (Pristiq®)
- Lithium (Lithobid®)
- Milnacipran (Savella®)
- Paliperidone (Invega®)
- Varenicline (Chantix®)

Psychiatry (cont.)

Major gene-drug interaction

- Risperidone 1, 2, 64, 224
  (Risperdal®)
- Trimipramine 1, 2, 57, 94
  (Surmontil®)

Moderate gene-drug interaction

Minimal gene-drug interaction

- Chlorpromazine 1, 148, 190
  (Thorazine®)
- Desipramine 1, 2, 57
  (Norpramin®)
- Dextroamphetamine 1, 52, 65, 123
  (Dexedrine®)
- Flibanserin 1
  (Addyi®)
- Fluoxetine 1, 50, 66, 72, 111, 118, 151, 162, 188, 227
  (Prozac®, Sarafem®)
- Fluvoxamine 1, 55, 71, 82, 83, 179, 180, 186, 187, 188, 196, 231
  (Luvox®)
- Guanfacine 1, 122
  (Intuniv®, Tenex®)
- Haloperidol 1, 2, 147, 181, 209
  (Haldol®)
- Iloperidone 1
  (Fanapt®)
- Levomilnacipran 1
  (Fetzima®)
- Lisdexamfetamine 1, 52, 65, 123
  (Vyvanse®)
- Lurasidone 1
  (Latuda®)
- Mirtazapine 1, 2, 93, 112, 191, 200
  (Remeron®)
- Nefazodone 1, 168, 212
  (Serzone®)
- Nortriptyline 1, 2, 57, 144, 210
  (Pamelor®)
- Paroxetine 1, 2, 55, 70, 84, 131, 156, 170, 188, 202, 226
  (Paxil®)
- Perphenazine 1, 143
  (Etrafon®)
- Pimozide 1, 209
  (Orap®)
- Protriptyline 1
  (Vivactil®)
- Quetiapine 1, 11, 91, 204, 208
  (Seroquel®)
- Thioridazine 1
- Trazodone 1
  (Desyrel®)
- Venlafaxine 1, 2, 213
  (Effexor®)

Limited pharmacogenetic impact

Psychiatry (cont.)

Major gene-drug interaction	Moderate gene-drug interaction	Minimal gene-drug interaction	Limited pharmacogenetic impact
		▪ Vilazodone 1, 17 (Viibryd®) ▪ Vortioxetine 1 (Trintellix®)	

Rheumatology

Major gene-drug interaction	Moderate gene-drug interaction	Minimal gene-drug interaction	Limited pharmacogenetic impact
	▪ Lesinurad + 1 (Zurampic®)	▪ Allopurinol 39, 54, 63, 88, 172 (Aloprim®, Zyloprim®) ▪ Cevimeline 1 (Evoxac®) ▪ Colchicine 1 (Colcrys®) ▪ Methotrexate 1, 158, 160, 203, 233 (Rheumatrex®) ▪ Tofacitinib 1 (Xeljanz®)	▪ Belimumab (Benlysta®)

Sleep medicine

Major gene-drug interaction	Moderate gene-drug interaction	Minimal gene-drug interaction	Limited pharmacogenetic impact
	▪ Ramelteon − 1 (Rozerem®)	▪ Armodafinil 1 (Nuvigil®) ▪ Eszopiclone 1 (Lunesta®) ▪ Modafinil 1 (Provigil®) ▪ Triazolam 1, 204 (Halcion®) ▪ Zolpidem 1, 13, 212 (Ambien®)	▪ Temazepam (Restoril®)

Urology

Major gene-drug interaction	Moderate gene-drug interaction	Minimal gene-drug interaction	Limited pharmacogenetic impact
		▪ Darifenacin 36, 87 (Enablex®) ▪ Fesoterodine 1 (Toviaz®) ▪ Finasteride 1 (Propecia®, Proscar®) ▪ Oxybutynin 1 (Ditropan®, Oxytrol®)	

Urology (cont.)

Major gene-drug interaction

Moderate gene-drug interaction

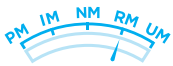
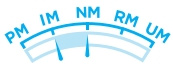
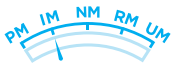
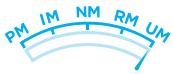
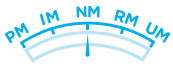
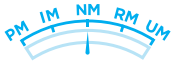
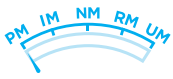
Minimal gene-drug interaction

- Sildenafil 1
  (Revatio®, Viagra®)
- Tadalafil 1
  (Adcirca®, Cialis®)
- Tamsulosin 1
  (Flomax®)
- Tolterodine 1
  (Detrol®)
- Vardenafil 1
  (Levitra®)

Limited pharmacogenetic impact

Genotype-derived classification of medications is provided as a service by OneOme and is intended solely for use by a medical professional who has reviewed and understands all sections within this report, including possible limitations of the services provided by OneOme. The relationships between the drugs and pharmacogenes annotated in this report are supported by scientific evidence that meets OneOme's critieria for inclusion. The order in which drugs are listed does not have any clinical or medical implications. Commonly used trade names for medications are listed for reference only. The list may not be inclusive of all trade names available and does not indicate preference or recommendation by OneOme of one medication product over another. For more information on these medications, for a list of additional medications curated but not annotated by OneOme, or to evaluate possible drug-to-drug interactions, please consult the RightMed Advisor, which is accessible through the provider portal at oneome.com.

Gene and phenotype summary

Gene	Genotype		Phenotype summary / Metabolic status
CYP1A2	*1A/*1F		Rapid Increased activity. Drugs converted to active metabolite(s) may cause side effects or toxicity. Active drugs converted to inactive metabolite(s) may lack efficacy.
CYP2B6	*1/*5		Intermediate to Normal Decreased activity. Drugs converted to active metabolite(s) may have reduced efficacy. Active drugs converted to inactive metabolite(s) may cause side effects or toxicity.
CYP2C9	*1/*3		Intermediate Decreased activity. Drugs converted to active metabolite(s) may have reduced efficacy. Active drugs converted to inactive metabolite(s) may cause side effects or toxicity.
CYP2C19	*17/*17		Ultrarapid Increased activity. Drugs converted to active metabolite(s) may cause side effects or toxicity. Active drugs converted to inactive metabolite(s) may lack efficacy.
CYP2C Cluster	rs12777823 GG		Normal Normal warfarin clearance associated with CYP2C rs12777823, independent of CYP2C9*2 and *3. CYP2C rs12777823, together with CYP4F2, CYP2C9, and VKORC1, influences response to warfarin therapy.
CYP2D6	*1/*1		Normal Normal level of activity. Drugs metabolized at a normal rate.
CYP3A4	*1/*1		Normal Normal level of activity. Drugs metabolized at a normal rate.
CYP3A5	*3/*3		Poor Normal dosing may be required because original dosing guidelines for drugs have been established on patients with poor metabolizer phenotype.
CYP4F2	*1/*1		Normal activity Normal activity of the CYP4F2 enzyme, which catalyzes the metabolism of vitamin K, in counterpoint to the activity of VKORC1. CYP4F2, together with CYP2C9, VKORC1, and a variant in CYP2C Cluster, influences response to warfarin therapy.
COMT	rs4680 GG		High activity COMT activity with GG (Val/Val) genotype is predicted to be higher than with AA (Met/Met) or GA (Val/Met) genotypes at rs4680.
DPYD	*1/*1		Normal risk Normal metabolizer with a dihydropyrimidine dehydrogenase (DPD) activity score of 2. Fully functional DPD enzyme activity. Normal risk of toxicities related to the administration of fluoropyrimidines (5-fluorouracil, capecitabine, and tegafur).
DRD2	rs1799978 GG		Reduced response Genotype is associated with a lower likelihood of improvement in schizophrenia symptoms with risperidone compared to the AA or AG genotypes. Other clinical and/or genetic factors may influence response.

Gene and phenotype summary (cont.)

F2	rs1799963 GG		**Normal risk** Normal risk of thrombosis associated with Factor II (prothrombin). Other genetic and clinical factors contribute to the risk for thrombosis.
F5	rs6025 GG		**Normal risk** Normal risk of thrombosis associated with Factor V. Other genetic and clinical factors contribute to the risk for thrombosis.
GRIK4	rs1954787 CC		**Normal response** Genotype predicts a normal response to citalopram in patients with major depressive disorder related to the GRIK4 genotype alone. Other clinical and genetic factors may influence response.
HLA-A	Positive for *31:01		**Increased risk** Increased risk of carbamazepine-induced hypersensitivity associated with the HLA-A*31:01 allele. Cross-reactivity with oxcarbazepine, eslicarbazepine, phenytoin, fosphenytoin, and lamotrigine cannot be excluded. Hypersensitivity and severe cutaneous reactions may occur regardless of the presence of the HLA-A*31:01 allele, in particular the presence of the HLA-B*15:02 allele has been associated with severe cutaneous reactions induced by certain antiepileptic agents.
HLA-B	Negative		**Normal risk** Negative for the presence of the HLA-B*15:02, HLA-B*57:01, and HLA-B*58:01 alleles. Normal risk of severe cutaneous reactions induced by carbamazepine, oxcarbazepine, eslicarbazepine, phenytoin, fosphenytoin, lamotrigine, and allopurinol. Normal risk of abacavir-induced hypersensitivity reaction. No increased risk of pazopanib-induced severe hepatotoxicity related to HLA-B*57:01 genotype. Hypersensitivity, severe cutaneous reactions, and severe hepatotoxicity may occur regardless of the presence of HLA-B*15:02, HLA-B*57:01, or HLA-B*58:01 alleles, in particular the presence of the HLA-A*31:01 allele has been associated with hypersensitivity reactions induced by carbamazepine and possibly other antiepileptic agents.
HTR2A	rs7997012 AA		**Intron 2 genotype AA** Genotype predicts an increased likelihood of response to citalopram related to the HTR2A genotype alone. Other clinical and genetic factors may influence response.
HTR2C	rs3813929 CC		**Normal risk** Genotype predicts a normal risk of weight gain with clozapine or olanzapine treatment. Other clinical and/or genetic factors may influence response. The HTR2C gene is located on the X chromosome. In patients with only one X, result should read rs3813929 C;-.
IFNL4	rs12979860 CT		**Reduced response** Genotype predicts a reduced likelihood of sustained virologic response (SVR) with peginterferon-containing regimens.
NUDT15	rs116855232 CC		**Normal risk** No increased risk of severe toxicities with thiopurine administration related to the NUDT15 genotype. Toxicities with thiopurines can also occur due to impaired TPMT activity, regardless of the NUDT15 status.

Gene and phenotype summary (cont.)

OPRM1	rs1799971 GG		**Asp/Asp isoform** OPRM1 Asp/Asp (GG) genotype associated with decreased sensitivity to the analgesic effects of alfentanil, codeine, fentanyl, morphine, and tramadol compared to patients with the OPRM1 Asn/Asn (AA) and Asn/Asp (AG) genotypes at rs1799971. A class effect association of opioids and OPRM1 genotype has been suggested, however evidence for other opioids is limited. Additional studies are required for specific drug-gene pairs to confirm an association.
SLC6A4	L/L (La/La)		**Typical to increased expression** Genotype predicts a typical to increased expression of the SLC6A4 transporter compared to patients with other genotypes. The L/L genotype has been associated with increased likelihood and potentially quicker response to the SSRIs fluoxetine, fluvoxamine, and possibly citalopram and escitalopram. The opposite trend in response has been observed in East Asian populations, showing increased likelihood and potentially quicker response in carriers of the S allele.
SLCO1B1	*1A/*1A		**Normal risk** Normal function of SLCO1B1. Normal risk of simvastatin-induced myopathy. Likelihood of normal response with pravastatin. Normal risk of methotrexate-induced toxicities when used at high dose.
TPMT	*1/*4		**Increased risk** Intermediate TPMT metabolizer. Increased risk of myelotoxicity with azathioprine, mercaptopurine, and thioguanine. Toxicities with thiopurines can also occur due to impaired NUDT15 activity independently of the TPMT status.
UGT1A1	*1/*1		**Normal risk** Normal metabolizer with fully functional UGT1A1 enzyme activity. No increased risk for severe neutropenia while taking irinotecan or for toxicity and/or hyperbilirubinemia while taking atazanavir, nilotinib, pazopanib or belinostat. Consult drug labeling for dosing recommendations.
VKORC1	rs9923231 GG		**Normal activity** Normal activity of the vitamin K epoxide reductase enzyme, associated with c.-1639GG (rs9923231). VKORC1, together with CYP2C9, CYP4F2, and a variant in CYP2C Cluster, influences response to warfarin therapy.

CYP phenotype abbreviations

PM	Poor metabolizer
IM	Intermediate metabolizer
NM	Normal metabolizer
RM	Rapid metabolizer
UM	Ultrarapid metabolizer

Test information

Specimen ID: **BU20190100000**
Specimen type: **Buccal swab**
Collection date: **2019-01-05**
Receive date: **2019-01-07**

Clinical Testing Performed By:
OneOme
807 Broadway St. NE Suite 100
Minneapolis, MN 55413

Lab director: **Bronwyn R. Hartung, PhD**
CLIA: **24D2109855**
CAP: **9432670**
NY PFI: **9226**

Test results

The following analytical results were interpreted by OneOme to produce the pharmacogenomic interpretations and annotations described in the *Gene and phenotype summary*. Method-specific analytical limitations or inferred haplotypes may limit the ability to produce a definitive phenotype interpretation. See *Methodology and limitations* and/or the *Report and laboratory comments* sections for additional information.

CYP1A2 *1A/*1F

rs2069514	NG_008431.2:g.28338G>A	GG
rs2069526	NM_000761.4:c.-10+103T>G	TT
rs12720461	NM_000761.4:c.-10+113C>T	CC
rs35694136	NM_000761.4:c.-1635delT	TT
rs762551	NM_000761.4:c.-9-154C>A	CA

CYP2B6 *1/*5

rs3211371	NM_000767.4:c.1459C>T	CT
rs3745274	NM_000767.4:c.516G>T	GG
rs2279343	NM_000767.4:c.785A>G	AA
rs28399499	NM_000767.4:c.983T>C	TT

CYP2C9 *1/*3

rs28371685	NM_000771.3:c.1003C>T	CC
rs1057910	NM_000771.3:c.1075A>C	AC
rs56165452	NM_000771.3:c.1076T>C	TT
rs28371686	NM_000771.3:c.1080C>G	CC
rs72558193	NM_000771.3:c.1190A>C	AA
rs1057911	NM_000771.3:c.1425A>T	AT
rs1799853	NM_000771.3:c.430C>T	CC
rs7900194	NM_000771.3:c.449G>A	GG
rs9332131	NM_000771.3:c.817delA	AA

CYP2C19 *17/*17

rs12248560	NM_000769.2:c.-806C>T	TT
rs28399504	NM_000769.2:c.1A>G	AA
rs4986893	NM_000769.2:c.636G>A	GG
rs6413438	NM_000769.2:c.680C>T	CC
rs4244285	NM_000769.2:c.681G>A	GG

CYP2C Cluster rs12777823 GG

rs12777823	NC_000010.10:g.96405502G>A	GG

CYP2D6 *1/*1

rs1080985	NM_000106.5:c.-1584C>G	CC
rs1065852	NM_000106.5:c.100C>T	CC
rs59421388	NM_000106.5:c.1012G>A	GG
rs72549346	NM_000106.5:c.1088_1089insGT	--
rs5030862	NM_000106.5:c.124G>A	GG
rs267608319	NM_000106.5:c.1319G>A	GG
rs774671100	NM_000106.5:c.137_138insT	--
rs765776661	NM_000106.5:c.1411_1412insTGCCCACTG	GTGCCCACGTGCCCAC
rs1135840	NM_000106.5:c.1457G>C	GG
rs201377835	NM_000106.5:c.181-1G>C	GG
rs769258	NM_000106.5:c.31G>A	GG
rs28371706	NM_000106.5:c.320C>T	CC
rs5030655	NM_000106.5:c.454delT	TT
rs5030865	NM_000106.5:c.505G>[A,T]	GG
rs3892097	NM_000106.5:c.506-1G>A	GG
rs72549354	NM_000106.5:c.632_633insG	--
rs72549353	NM_000106.5:c.765_768delAACT	AACTAACT
rs35742686	NM_000106.5:c.775delA	AA
rs5030656	NM_000106.5:c.841_843delAAG	AAGAAG
rs16947	NM_000106.5:c.886C>T	CC
rs5030867	NM_000106.5:c.971A>C	AA
rs79292917	NM_000106.5:c.975G>A	GG
rs28371725	NM_000106.5:c.985+39G>A	GG

CYP3A4 *1/*1

rs2740574	NM_017460.5:c.-392G>A	AA
rs35599367	NM_017460.5:c.522-191C>T	CC

CYP3A5 *3/*3

rs41303343	NM_000777.4:c.1035_1036insT	--
rs776746	NM_000777.4:c.219-237G>A	GG
rs10264272	NM_000777.4:c.624G>A	GG

CYP4F2 *1/*1

rs2108622	NM_001082.4:c.1297G>A	GG

COMT rs4680 GG

rs4680	NM_000754.3:c.472G>A	GG

DPYD *1/*1

rs55886062	NM_000110.3:c.1679T>G	TT
rs3918290	NM_000110.3:c.1905+1G>A	GG
rs67376798	NM_000110.3:c.2846A>T	TT

DRD2 rs1799978 GG

rs1799978	NM_000795.3:c.-585A>G	GG

Test results (cont.)

F2 rs1799963 GG

rs1799963	NM_000506.4:c.*97G>A	GG

F5 rs6025 GG

rs6025	NM_000130.4:c.1601G>A	GG

GRIK4 rs1954787 CC

rs1954787	NM_001282470.2:c.83-10039T>C	CC

HLA-A Positive for *31:01

HLA00097	NM_002116 (interrogated at exon 2)	Positive

HLA-B Negative

HLA00386	NM_005514 (interrogated at exon 2 and intron 2)	Negative
HLA00381	NM_005514 (interrogated at exon 3)	Negative
rs144012689	NM_005514.7:c.1012+104A>T	AA

HTR2A rs7997012 AA

rs7997012	NM_000621.4:c.614-2211T>C	TT

HTR2C rs3813929 CC

rs3813929	NM_000868.3:c.-759C>T	CC

IFNL4 rs12979860 CT

rs12979860	NM_001276254.2:c.151-152G>A	CT

NUDT15 rs116855232 CC

rs116855232	NM_018283.3:c.415C>T	CC

OPRM1 rs1799971 GG

rs1799971	NM_000914.4:c.118A>G	GG

SLC6A4 L/L (La/La)

rs774676466	NM_001045.5:c.-1917_-1875del43	LL
rs25531	NM_001045.5:c.-1936A>G	AA

SLCO1B1 *1A/*1A

rs4149015	NM_006446.4:c.-910G>A	GG
rs2306283	NM_006446.4:c.388A>G	GG
rs4149056	NM_006446.4:c.521T>C	TT

TPMT *1/*4

rs1800462	NM_000367.3:c.238G>C	GG
rs1800460	NM_000367.3:c.460G>A	GG
rs1800584	NM_000367.3:c.626-1G>A	CT
rs1142345	NM_000367.3:c.719A>G	AA

UGT1A1 *1/*1

rs4148323	NM_001072.3:c.862-6536G>A	GG
rs1976391	NM_001072.3:c.862-9697A>G	AA

VKORC1 rs9923231 GG

rs9923231	NM_001311311.1:c.-1639G>A	GG
rs7200749	NM_024006.5:c.358C>T	GG

Methodology and limitations

Analytical results were produced using tests developed and validated by OneOme, LLC, a clinical laboratory located at 807 Broadway Street NE Suite 100, Minneapolis, MN 55413. These tests have not been cleared or approved by the U.S. Food and Drug Administration. OneOme is certified under CLIA-88 and accredited by the College of American Pathologists as qualified to perform high-complexity testing. This test is used for clinical purposes and should not be regarded as investigational or for research.

Genomic DNA was analyzed by PCR using Thermo Fisher TaqMan® and/or LGC Biosearch BHQ® probe-based methods to interrogate the variant locations listed in the *Test results* table above. In addition, CYP2D6 copy number status was assessed at sites within the promoter, intron 2, intron 6, and exon 9. The test detects CYP2D6 deletions, duplications/multiplications, and hybrid alleles, but cannot differentiate duplications in the presence of a deletion.

Haplotypes, or combinations of inherited variants on a chromosome, are imputed and annotated in the report according to legacy nomenclature for the following genes and alleles:

CYP1A2	*1C, *1D, *1E, *1F, *1J, *1K, *1L, *1V, *1W
CYP2B6	*4, *5, *6, *7, *9, *16, *18
CYP2C9	*2, *3, *4, *5, *6, *8, *11
CYP2C19	*2, *3, *4, *4B, *10, *17
CYP2D6	*2A, *2, *3, *4, *4J *4N, *4M, *5, *6, *6C, *7, *8, *9, *10, *11, *12, *13, *14A, *14B, *15, *17, *18, *19, *29, *31, *34, *35, *36, *39, *41, *42, *59, *61, *63, *64, *68, *69, *70, *91, *109
CYP3A4	*1B, *22
CYP3A5	*3, *6, *7
CYP4F2	*3
DPYD	*2A, *13
SLCO1B1	*5, *15, *17, *21
TPMT	*2, *3A, *3B, *3C, *4
UGT1A1	*6, *28

The test does not detect all known and unknown variations in the genes tested, nor does absence of a detectable variant (designated as *1 for genes encoding drug metabolizing enzymes) rule out the presence of other, non-detected variants.

As with other common SNP genotyping techniques, these assays cannot differentiate between the maternal and paternal chromosomes. In cases where observed variants are associated with more than one haplotype, OneOme infers and reports the most likely diplotype based on published allele frequency and/or ethnicity data. Inferences with potential clinical impact are reported in the *Report and laboratory comments* section.

The variant detection methods validated by OneOme provide >99.9% accuracy; however, PCR may be subject to general interference by factors such as reaction inhibitors and low quality or quantity of extracted DNA. When present, these interferents typically yield no result rather than an inaccurate one. Very infrequent variants or polymorphisms occurring in primer- or probe-binding regions may also affect testing and could produce an erroneous result or assay failure. Variant locations tested by the assay but not assigned a genotype call are reported as “No Call.” Test results and clinical interpretation may be inaccurate for individuals who have undergone or are receiving non-autologous blood transfusions, tissue, and/or organ transplant therapies. Although extremely rare, results could also be impacted by other factors not addressed above, such as laboratory error.

Due to the complexity of interpreting some genetic test results, such as those that may carry a probabilistic risk of disease, patients and providers should consider the benefits of consulting with a trained genetic counseling professional, physician, or pharmacogenomic specialist. Patients and providers are also encouraged to visit oneome.com to explore the tools and resources available to help understand these test results. For additional support, contact OneOme through the website or by calling 844-663-6635.

OneOme liability disclaimer

The interpretations and clinical annotations provided by OneOme are intended solely for use by a medical professional and do not constitute medical advice by OneOme. The treating provider remains ultimately responsible for all diagnosis and treatment decisions for the patient. Information included in this report is based upon scientific literature and does not take into account other genetic variants and environmental or social factors that may affect a patient's response. Other factors not included in this report include, but are not limited to, environmental factors (e.g., smoking), health factors (e.g., diet), social and familial factors, various medical conditions, and drug-to-drug interactions. Administration of any medication, including the ones listed in the OneOme reports, requires careful therapeutic monitoring regardless of the phenotype or genotype-derived recommendation. As a matter of practice, OneOme will routinely update its pharmacogenomic database as new information becomes available to the scientific community. Genotype-predicted interactions and annotations found on the patient's RightMed comprehensive test report, RightMed Advisor reports, or RightMed specialty reports are therefore dependent on the date of generation and/or the database version used to generate that report. Providers may access these reports with updated annotations using OneOme's latest released version through the provider portal at portal.oneome.com.

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