MediCarr

Precision Driven Care®™

PHARMACOGENOMICS

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PHARMACOGENETICS

About Our PGx Testing®

We are committed to increasing awareness, understanding and clinical use of pharamacogenetic testing. Our 18 gene PGx Advantage® testing profile provides information about the connection between a patient's unique genetic makeup and their response to certain medications, including those used for cardiology, pain management and psychiatry. We understand you are continuously pursuing ways to enhance the care you provide. Our PGx Advantage® provides information that enables you to offer tailored medication to meet your patients' unique needs.

Studies have shown:

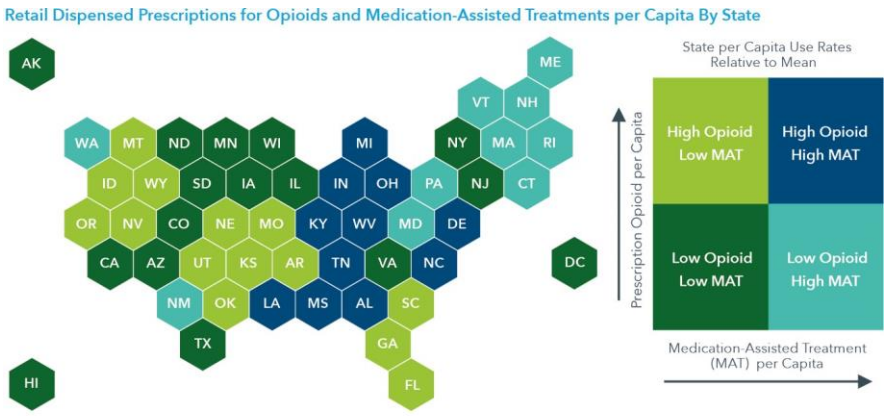
- Approximately 82% of adults in the US take at least one medication. [1]
- Approximately 29% of adults in the US are prescribed five or more medications. [1]
- Adverse Drug Reactions (ADRs) lead to over 700,000 emergency room visits, 120,000 hospitalizations and 100,000 deaths in the US each year. [1]
- More than 50% of the patient population is dosing ineffectively due in part to a genetic mismatch between the patient's metabolism and the medication. [1]

Recent genetic research has helped to create a better understanding of this mismatch by explaining the significance of genetics in drug metabolism. Information about a patient's genetic makeup, coupled with their lifestyle behavior and other risk factors, enhances the physician's ability to provide personalized medical care and treatment for each

WHAT IS PHARMACOGENETICS?

Pharmacogenetics is the study of your unique genetic makeup and how it influences drug effectiveness in order to personalize a patient's drug therapy. Currently, medications are prescribed based on the patient's weight, height, gender, condition, and previous drug history resulting in trial and error.

There are many pathways in our body that metabolize drugs and even a small variation in our genetics can contribute to an adverse drug reaction. These risks can be significantly minimized through Pharmacogenetic testing.



Source: IQVIA Xponent, US Census Bureau, Feb 2019
Chart notes: Per capita figures expressed per 1,000 population. Analysis based on opioid medicines for pain management and exclude those medicines used for medication-assisted opioid use dependency treatment (MAT) or overdose recovery. Opioid medicines are categorized and adjusted based on their relative intensity to morphine, see Methodology section for more details. High denotes above the mean. Low denotes below the mean.
Report: Medicine Use and Spending in the U.S. – A Review of 2018 and Outlook to 2023. IQVIA Institute for Human Data Science, May 2019

VARIABILITY IS THE LAW OF LIFE

Our genetic makeup is complex, not only does it determine our physical attributes but also how we live, breathe, and interact with all of the chemical compounds needed for life. Your genetic factors can account for 20 to 90 percent of variability in how each person responds to drugs.

As our genetics determine our eye and hair color, they also determine how our body metabolizes drugs. We will analyze your DNA to see if the® prescribed medications you are taking are safe and effective, as well as identifying alternatives that may work better .

RISK FACTORS AND BENEFITS

Many factors contribute to the likelihood of an adverse drug reaction including:

- ✓ Hereditary factors
- ✓ Very young or old age
- ✓ Pregnancy and breast feeding
- ✓ Simultaneous use of multiple drugs

Some of the benefits of Pharmacogenetics are:

- ✓ Improved standard of care
- ✓ Advanced screening for disease
- ✓ More effective medications
- ✓ Decrease in the overall cost of health care
- ✓ Accurate methods of determining drug dosages

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DRUG INTERACTIONS

COMMON FOOD-DRUG INTERACTIONS

CALCIUM AND ANTIBIOTICS

Antibiotics, such as Tetracycline, can interact with dairy produce like milk, yogurt, and cheese. The body is then unable to effectively absorb the antibiotic as a result of the calcium content.

VITAMIN K AND WARFARIN

Vitamin K is found in green leafy vegetables such as spinach, kale, and broccoli. Given that Warfarin works to inhibit the actions of vitamin K, patients must be counseled to avoid over consuming these foods.

GRAPEFRUIT JUICE AND STATINS

Statins, such as Lipitor® (Atorvastatin), should not be consumed with grapefruit juice, as the juice contains furanocoumarin compounds that increase the drugs potency. This may lead to a condition causing a breakdown of muscle tissue.

MOST COMMON DRUG-DRUG INTERACTIONS

After decades of pharmaceutical studies, there are some drug-drug interactions that physicians have observed very consistently. They are listed to the right as well as the common side effects.

WHAT IS A DRUG-DRUG INTERACTION?

Drug-drug interactions occur when a drug interacts, or interferes, with another drug. This can alter the way one or both of the drugs act in the body, or cause unexpected side effects. The drugs involved can be prescription medications, over-the-counter medicines and even vitamins and herbal products.

ARE ALL DRUG-DRUG INTERACTIONS THE SAME?

Not all drug-drug interactions are equal. Sometimes when two drugs interact, the overall effect of one or both of the drugs may be greater than intended. For example, both aspirin and blood-thinners like Coumadin® (Warfarin) are used to protect against a heart attack - They help to prevent blood clots from forming. Using these medications together, however, may cause excessive bleeding.

Other times, the overall effect of one or both of the drugs may be less than desired. For example, certain antacids can prevent many medications (such as antibiotics, blood-thinners and heart medications) from being absorbed into the blood stream. If this happens, the medication may not work as well - or may not work at all.

ARE DRUG-DRUG INTERACTIONS LIMITED TO PRESCRIPTION MEDICATIONS?

Drug-drug interactions occur when a drug interacts, or interferes, with another drug. This can alter the way one or both of the drugs act in the body, or cause unexpected side effects. The drugs involved can be prescription medications, over-the-counter medicines and even vitamins and herbal products.

Source: American Pharmaceutical Association

Drug Interaction	Potential Risk
Fluoxetine and Phenelzine	Agitation, diaphoresis, tachycardia, and death
Digoxin and Quinidine	Nausea, vomiting, and death
Sildenafil and Isosorbide Mononitrate	Obesity and hypertension
Potassium Chloride and Spironolactone	Hyperkalemia
Clonidine and Propranolo	Severe hypertension and vasoconstriction
Warfarin and Diflunisal	GI bleeding and fatal hemorrhaging
Theophylline and Ciprofloxacin	Headache, dizziness, hypotension, and tachycardia
Methotrexate and Probenecid	Diarrhea, vomiting, and renal failure

WHAT IS AN ADVERSE DRUG EVENT?

Unexpected or dangerous reactions caused by an administered drug is an adverse drug reaction.

Adverse drug reactions are the 4th leading cause of death in America. According to the Federal Drug Administration, about 4.5 million Americans visit their doctor's office or the emergency room every year because of adverse side effects related to prescription medications.

The use of prescription medications has increased at a steady rate over the last decade. Researchers at The Mayo Clinic and Olmsted Medical Center have shown that nearly 70 percent of Americans are taking at least one prescription drug, and more than half take two. The associated drug interactions between these medications are not always properly identified when prescribed, nor is the way each patient metabolizes each drug.

Take Action - Prevent Adverse Drug Reactions!

Pharmacogenetics
+ DNA
=
The Right Medication For Your Patient!

Pharmacogenetic testing is rapidly being adopted among clinicians as a valuable diagnostic tool to enhance drug safety. This brand of personalized medicine determines optimal patient outcomes by giving you the ability to prescribe medications confidently.

Factors affecting how we metabolize drugs:

- ✓ Age
- ✓ Gender
- ✓ Ethnicity
- ✓ Diet
- ✓ Drug to Drug Interactions
- ✓ Genetic Variation
- ✓ Hormone Balance
- ✓ Impaired Liver & Kidney Function

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PRODRUGS

For Physicians

This list is designed to assist your selection of medications. Genetic variations that encode for enzymes can alter the metabolic rates of prescribed medications. Prodrugs need to be metabolized into an active metabolite before they can deliver maximum therapeutic value.

Generic Name	Trade Name
Bupropion*	Wellbutrin
Bupropion*	Zyban
Bupropion*	Aplenzin
Carbamazepine	Tegretol
Carbamazepine	Carbatrol
Carisoprodol	Soma
Clopidogrel	Plavix
Codeine	Codeine
Codeine	Floricet with Codeine
Fesoterodine	Toviaz
Fosphenytoin	Cerebyx
Lisdexamfetamine*	Vyvanse
Nabumetone	Relafen
Rabeprazole	Aciphex
Sulindac	Clinoril
Tramadol	Ultram

*Indicates psychotropics

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THE TESTING PROCESS

IMPACTED MEDICATIONS AND GENES TESTED

Category	Drug Class	Generic Name	Trade	Gene
Cardiovascular	Angiotensin II Receptor Antagonists	Losartan	Cozaar	CYP2C9
	Antianginal Agents	Ranolazine	Ranexa	CYP2D6
	Antiarrhythmics	Flecainide	Tambocor	CYP2D6
	Anticoagulants	Warfarin	Coumadin	CYP2C9
	Antiplatelets	Clopidogrel	Plavix	CYP2C19
	Beta Blockers	Metoprolol	Lopressor	CYP2D6
	Diuretics	Torsemide	Demadex	CYP2C9
	Statins	Simvastatin	Zocor	SLCO1B1
Diabetes	Meglitinides	Nateglinide	Starlix	SLCO1B1, CYP2C9
	Sulfonylureas	Glimepiride	Amaryl	CYP2C9
Gastrointestinal	Antiemetics	Dolasetron	Anzemet	CYP2D6
	Proton Pump Inhibitors	Lansoprazole	Prevacid	CYP2C19
Infections	Antifungals	Voriconazole	Vfend	CYP2C19
	Antimalarials	Proguanil	Malarone	CYP2C9
Pain	Muscle Relaxants	Carisoprodol	Soma	CYP2C19
	NSAIDs	Celecoxib	Celebrex	CYP2C9
	Opioids	Hydrocodone	Vicodin	CYP2D6
	Antiaddictives	Naltrexone	Contrave	OPRM1
Psychotropic	Anti-ADHD	Amphetamine	Adderall	COMT
	Anticonvulsants	Phenytoin	Dilantin	CYP2C9
	Antidementia Agents	Donepezil	Aricept	CYP2D6
	Antidepressants	Sertraline	Zoloft	CYP2C19
	Antipsychotics	Aripiprazole	Abilify	CYP2D6
	Benzodiazepines	Diazepam	Valium	CYP2C19
	Other Neurological Agents	Flibanserin	Addyi	CYP2D6
Rheumatology	Immunomodulators	Leflunomide	Arava	CYP2C19
Transplantation	Immunosuppressants	Tacrolimus	Prograf	CYP3A5
Urologicals	5-Alpha Reductase Inhibitors	Dutasteride	Avodart	CYP3A4
	Alpha-Blockers for Hyperplasia	Alfuzosin	Uroxatral	CYP3A4
	Antispasmodics	Oxybutynin	Ditropan	CYP3A4
	Phosphodiesterase	Avanafil	Stendra	CYP3A4

**The above listing is not inclusive of all drugs or genes tested, but does include all drug classes tested in AEON Global Health's PGx Advantage test.*

We also offer SLC6A4 genotyping, which may help predict success or failure of SSRI treatment in patients suffering from depression.

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TOXICITY:

IS MEDICINE MAKING YOUR PATIENT SICK?

Drug toxicity is a common health problem that can go undetected as being the cause of symptoms such as dizziness, memory loss, and fatigue. Toxicity can occur when medication dosage is incorrect or the ability to metabolize the drug changes due to increased age, or change of weight.

CARDIAC RISK FACTORS

Some of the genetic markers found in our comprehensive PGx test indicate whether patients are genetically predisposed to an increased risk of heart disease such as thrombosis, stroke, and other cardiac related conditions. Once these risks are identified, preventative steps can be taken. This can significantly reduce the need for future invasive medical procedures and vastly improve the standard of care.

It often takes multiple attempts to find the right cardiac medication. PGx gives guidance® to your physician, decreasing the possibility of adverse reactions caused by the wrong medication choice or dosage. The genetic markers involved help your physician determine the dosing requirements, risks involved, and/or the utility of prescribing Plavix®, Warfarin, Statins, and Beta Blockers.

Serious Side Effects of Medications:

- ✓ Stroke
- ✓ Physical Debilitation
- ✓ Heart Disease
- ✓ Death

Common Side Effects

- ✓ Nausea
- ✓ Constipation
- ✓ Diarrhea
- ✓ Drowsiness
- ✓ Pain in Extremities
- ✓ Skin Reactions
- ✓ Dizziness
- ✓ Weight Fluctuations
- ✓ Fatigue
- ✓ Sleep Disorder

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WHO CAN BENEFIT FROM PHARMACOGENETIC TESTING?

PGx can improve outcomes for patients, reduce costs for payers, and enhance the overall quality of care delivered by the physician. These tests can reduce the number of failed drug treatments, adverse drug reactions, the number of medications a patient takes before finding the correct one, and provide a more complete clinical picture for each patient.

Patients who can benefit from PGx testing include®:

- ✓ those taking multiple medications
- ✓ those on complex drug treatment plans
- ✓ those on ineffective treatment plans
- ✓ those with previous ADRs to medications
- ✓ children before starting prescription medication

WHY MEDICARR?

Broad Testing Profile

Our profile provides information for physicians to identify how a patient metabolizes 200+ medications across 30 different drug classes and the genetic-metabolic relationships for anti-fungal, antiemetic, organic acid disorder, immunosuppressant and urinary incontinence medications. Risk factors for thrombophilia, hyperhomocysteinemia and dysilpidemia are also assessed.

Safer and More Effective Treatment

We help physicians maximize drug efficacy while minimizing adverse drug affects and drug to drug interactions. We provide you with information that allows you to prescribe the right drug at the correct dosage based on an individual's genotype as well as their weight and age.

Easily Interpreted and Clinically Actionable Reports

Our testing reports are comprehensive and easy to understand. In each testing protocol, the outcomes are produced in simple formats delivered via our structured portal or EMR. We also employ trained genetic scientists that provide professional assistance in the interpretation of results when necessary.

Exceptional Customer Service

We understand that the work we do impacts the quality of your patient's health. With that in mind, we focus on providing exceptional customer service by providing our partnered healthcare professionals with customized service plans to maximize the delivery of care for patients.

Quick Turnaround Time

We use the latest technology to analyze patients' samples in a rapid and accurate manner. Our Quant Studio PCR instruments yield precise and timely results.

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MEDICATION LIST & DRUG PANELS

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Cardiac Profile

Generic Name	Trade Name	Specialty	Gene	Evidence	Panel	
Apixaban	Eliquis	Anticoagulant	CYP3A4/CYP3A5 minor from CYP1A2/CYP2J2	2	INF	●
Atenolol	Tenormin	Beta Blocker	Affected by Multiple Genes	2	INF	●
Atorvastatin	Lipitor	Statin	SLCO1B1/CYP3A4	2	INF	●
Azilsartan	Edarbi/Edarbyclor	Angiotensin II Receptor Antagonists	CYP2C9	2	INF	●
Bisoprolol	Zebeta	Beta Blockers	CYP3A4 minor from CYP2D6	2	INF	●
Candesartan	Atacand	Angiotensin II Receptor Antagonists	Affected by Multiple Genes	1	ACT	●
Carvedilol*	Coreg	Beta blockers	CYP2D6	1	ACT	●
Clopidogrel**P	Plavix	Antiplatelets	CYP2C19	1	ACT	●
Dabigatran Etexilate	Pradaxa	Anticoagulant	Affected by Multiple Genes	2	INF	●
Edoxaban	Savaysa	Anticoagulant	CYP3A4	2	INF	●
Eprosartan	Teveten	Angiotensin II Receptor Antagonists	Affected by Multiple Genes	1	ACT	●
Flecainide	Tambocor	Antiarrhythmic agent	CYP2D6	1	ACT	●
Fluvastatin	Lescol	Statin	SLCO1B1	2	INF	●
Fluvastatin	Lescol	Statin	CYP2C9	1	ACT	●
Fondaparinux	Arixtra	Anticoagulants	Affected by Multiple Genes	1	ACT	●
Irbesartan	Avapro	Anti- Inflammatory	CYP2C9	1	ACT	●
Labetalol	Normodyne, Trandate	Beta blockers	CYP2C19	2	INF	●
Losartan	Cozaar, Hyzaar	Angiotensin II Receptor Antagonists	CYP2C9	2	INF	●
Lovastatin	Mevacor, Altoprev, Advicor	Statin	SLCO1B1/CYP3A4	2	INF	●
Metoprolol*	Lopressor	Beta blockers	CYP2D6	1	ACT	●
Mexiletine	Mexitil	Antiarrhythmics	CYP2D6	1	ACT	●
Nebivolol	Bystolic	Beta Blockers	CYP2D6	1	ACT	●
Olmesartan	Benicar	Angiotensin II Receptor Antagonists	Affected by Multiple Genes	1	ACT	●
Pitavastatin	Livalo	Statins	SLCO1B1	2	INF	●
Prasugrel*	Effient	Antiplatelets	CYP2C19	1	ACT	●
Pravastatin*	Pravachol	Statins	SLCO1B1	2	INF	●
Propafenone*	Rythmol	Antiarrhythmics	CYP2D6	1	ACT	●
Propranolol*	Inderal	Beta Blockers	CYP2D6	1	ACT	●
Ranolazine	Ranexa	Antianginal Agents	CYP2D6	1	ACT	●
Rivaroxaban	Xarelto	Anticoagulant	CYP3A4/5, CYP2C19	2	INF	●
Rosuvastatin	Crestor	Statins	SLCO1B1	2	INF	●
Simvastatin	Zocor	Statins	SLCO1B1/CYP3A4	1	ACT	●
Telmisartan	Micardis	Angiotensin II Receptor Antagonists	CYP3A4	1	ACT	●

INF: Informative DRUG-GENE ASSOCIATIONS REQUIRING FURTHER INVESTIGATION **ACT**: Actionable ESTABLISHED EVIDENCE-BASED CLINICAL GUIDELINES

● Psych Profile ● Cardiac Profile ● Comprehensive Only ● Pain Profile

Generic Name	Trade Name	Specialty	Gene	Evidence		
Ticagrelor*	Brilinta	Antiplatelets	CYP3A5	2	INF	●
Timolol	Timoptic	Beta Blockers	CYP2D6	1	ACT	●
Torsemide	Demadex	Diuretics	CYP2C9	2	INF	●
Valsartan	Diovan, Entresto	Angiotensin II Receptor Antagonists	CYP2C9	1	ACT	●
Vorapaxar	Zontivity	Antiplatelets	CYP3A4	1	ACT	●
Warfarin*	Coumadin	Anticoagulants	CYP2C9*1/*1, VKORC1	1	ACT	●

Compreshensive Only

Generic Name	Trade Name	Specialty	Gene	Evidence		
Alfuzosin	UroXatral	Alpha-Beta Blocker for Benign Prostatic Hyperplasia	CYP3A4	2	INF	● ●
Amphotericin B	AmBisome, Abelcet	Antifungals	Affected by Multiple Genes	1	ACT	●
Anidulafungin	Eraxis	Antifungals	Affected by Multiple Genes	1	ACT	●
Apremilast	Otezla	Immunomodulators	CYP1A2, CYP3A4	2	INF	●
Aprepitant	Emendo-oral	Antiemetics	CYP3A4 minor from CYP1A2/CYP2C19	1	ACT	●
Avanafil	Stendra	Phosphodierterase Inhibitor for Erectile Dysfunction	CYP3A4	2	INF	●
Caspofungin	Cancidas	Antifungals	Affected by Multiple Genes	1	ACT	●
Chlorpropamide*	Diabenese	Anti-Diabetic	CYP2C9	2	INF	●
Colchicine	Mitigare	Anti-Hyperuricemics and Anti-Gout Agents	CYP3A4	2	INF	●
Darifenacin	Enablex	Antispasmodics for Overactive Bladder	CYP2D6	1	ACT	●
Dexlansoprazole*	Dexilant, Kapidex	Proton Pump Inhibitors	CYP2C19	2	INF	●
Dolasetron	Anzemet	Antiemetics	CYP2D6	2	INF	●
Dolutegravir	Tivicay, Triumeq	Anti-HIV Agents	UTG1A1 minor from CYP3A	1	ACT	●
Doxazosin	Cardura	Alpha-Beta Blocker for Benign Prostatic Hyperplasia	Affected by Multiple Genes	2	INF	
Dronabinol	Marinol	Antiemetics	CYP2C9	2	INF	●
Dutasteride	Avodart	Alpha-Beta Blocker for	CYP3A4/5	2	INF	●
		Benign Prostatic Hyperplasia				●
Esomeprazole*	Nexium	Proton Pump Inhibitors	CYP2C19	2	INF	●
Febuxostat	Uloric	Anti-Hyperuricemics and Anti-Gout Agents	CYP1A2/CYP2C8/CYP2C9	2	INF	● ●
Fesoterodinep	Toviaz	Antispasmodics for Overactive Bladder	CYP2D6	1	ACT	● ●
Finasteride	Proscar	5-Alpha Reductase Inhibitors for Benign Prostatic Hyperplasia	CYP3A4	2	INF	●
Flibanserin	Addyi	Receptor Agonist	CYP3A4/CYP2C19	1	ACT	●
Fluconazole	Diflucan	Antifungals	Affected by Multiple Genes	1	ACT	●

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Generic Name	Trade Name	Specialty	Gene	Evidence		
Glimepiride*	Amaryl	Antidiabetic Sulfonylureas	CYP2C9	2	INF	●
Glipizide*	Glucotrol	Antidiabetic Sulfonylureas	CYP2C9	2	INF	●
Glyburide*	Micronase	Antidiabetic Sulfonylureas	CYP2C9	2	INF	●
Granisetron	Sancuso, Sustol	Antiemetics	CYP3A4/5, CYP1A1	1	ACT	●
Isavuconazonium	Cresemba	Antifungals Antifungals	CYP3A4/5	1	ACT	●
Itraconazole	Sporanox	Antifungals	CYP3A4	1	ACT	●
Lansoprazole*	Prevacid	Proton Pump Inhibitors	CYP2C19	2	INF	●
Leflunomide	Arava	Immunomodulators	CYP2C19	1	ACT	●
Lesinurad	Zurampic	Anti-Hyperuricemics and Anti-Gout Agents CYP2C9	Affected by Multiple Genes	1	ACT	●
Metoclopramide*	Reglan	Antiemetics	CYP2D6	2	INF	●
Micafungin	Mycamine	Antifungals	Affected by Multiple Genes	1	ACT	●
Mirabegron	Myrbetriq	Antipassmodics for Overactive Bladder	CYP2D6	1	ACT	●
Nateglinide	Starlix	Diabetes Meglitinides	SLCO1B1, CYP2C9	2	INF	●
Nateglinide Palonosetron	Akynzeo	Antiemetic	CYP2D6	2	INF	●
Omeprazole*	Prilosec	Proton Pump Inhibitors	CYP2C19	1	ACT	●
Ondansetron	Zofran, Zuplenz	Antiemetics	CYP2D6	1	ACT	●
Oxybutynin	Ditropan	Antispasmodics for Overactive Bladder	CYP3A4	2	INF	●
Palonosetron	Aloxi	Antiemetics	CYP2D6	2	INF	●
Pantoprazole*	Protonix	Proton Pump Inhibitors	CYP2C19	1	ACT	●
Posaconazole	Noxafil	Antifungals	Affected by Multiple Genes	1	ACT	●
Proguanil	Malarone	Antimalarials	CYP2C19	2	INF	●
Rabeprazole*P	Aciphex	Proton Pump Inhibitors	CYP2C19	2	INF	●
Raltegravir	Isentress, Dutrebis	Anti-HIV Agents	UGT1A1	1	ACT	●
Repaglinide	Prandin, Prandimet	Diabetes Meglitinides	SLCO1B1	2	INF	●
Rolapitant	Varubi	Antiemetics	CYP3A4	1	ACT	●
Sildenafil	Viagra	Phosphodierterase Inhibitor for Erectile Dysfunction	CYP3A5	2	INF	●
Silodosin	Rapaflo	Alpha-Blockers for Benign Prostatic Hyperplasia	CYP3A4	2	INF	●
Solifenacin	Vesicare	Antispasmodics for Overactive Bladder	CYP3A4	2	INF	●
Tacrolimus	Prograf	Immunosupressants	CYP3A5	1	ACT	●
Tadalafil	Cialis	Phosphodiesterase Inhibitor for Erectile Dysfunction	CYP3A4	2	INF	●
Tamsulosin	Flomax	Alpha-Blockers for Benign Prostatic Hyperplasia	CYP2D6	1	ACT	●
Terazosin	Hytrin	Alpha-Blockers for Benign Prostatic Hyperplasia	Affected by Multiple Genes	2	INF	●

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Generic Name	Trade Name	Specialty	Gene	Evidence		
Tofacitinib	Xeljanz	Immunomodulators	CYP2C19	2	INF	
Tolbutamide	Orinase	Diabetes Sulfonylureas	CYP2C9	1	ACT	
Tolterodine*	Detrol	Antispasmatics for Overactive Bladder	CYP2D6	2	INF	
Trospium	Sanctura	Antispasmodics for	Affected by Multiple Genes	2	INF	
		Overactive Bladder				
Vardenafil	Levitra	Phosphodiesterase Inhibitor for Erectile Dysfunction	CYP3A5*1/*1	1	ACT	
Voriconazole*	Vfend	Antifungals	CYP2C19	1	ACT	

Pain Profile

Generic Name	Trade Name	Specialty	Gene	Evidence		
Alfentanil	Alfenta	Opioids	CYP3A4/CYP3A5	2	INF	
Buprenorphine	Butrans, Buprenex	Opioid	CYP3A4	2	INF	
Carisoprodol*	Soma	Muscle Relaxants	CYP2C19	1	ACT	
Celecoxib*	Celebrex	Anti- Inflammatory	CYP2C9	1	ACT	
Cyclobenzaprine	Flexeril, Amrix	Muscle Relaxants	CYP3A4/CYP1A2 minor from CYP2D6	2	INF	
Diclofenac	Voltaren	NSAIDs	CYP2C9	2	INF	
Dihydocodeine	Synalgos-DC	Opioid	CYP2D6	1	ACT	
Fentanyl	Actiq	Opioid	OPRM1	2	INF	
Flurbiprofen*	Ansaid	Anti- Inflammatory	CYP2C9	1	ACT	
Hydrocodone	Vicodin	Opioid	OPRM1	1	ACT	
Hydromorphone	Dilaudid, Exalgo	Opioid	Affected by Multiple Genes	2	INF	
Ibuprofen	Advil, motrin	Anti-Inflammatory	CYP2C9	2	INF	
Indomethacin	Indocin	Anti-Inflammatory	CYP2C9	1	ACT	
Ketoprofen	Orudis	Anti-Inflammatory	CYP2C9	2	INF	
Ketorolac	Toradol	Anti-Inflammatory	Affected by Multiple Genes	1	ACT	
Levorphanol	Levo Dromoran	Opioid	UGT2B7	1	ACT	
Meloxicam	Mobic	Anti-Inflammatory	CYP2C9	2	INF	
Meperidine	Demerol	Opioid	CYP2B6/CYP3A4/CYP2C19	2	INF	
Metaxalone	Skelaxin	Muscle Relaxants	CYP1A2, 2D6, 3A4	2	INF	
Methadone	Dolophine	Opioid	CYP2B6	2	INF	
Methocarbamol	Robaxin	Muscle Relaxants	Affected by Multiple Genes	2	INF	
Milnacipran	Savella	Fibromyalgia Agent	Affected by Multiple Genes	2	INF	
Morphine	MS Contin	Opioid	COMT, OPORM1	2	INF	
NabumetoneP	Relafen	NSAIDs	CYP1A2/CYP2C9	2	INF	
Naltrexone	Vivitrol, Contrave	Antiaddictives	OPRM1	2	INF	
Naproxen	Aleve	NSAIDs	CYP2C9, CYP1A2	2	INF	
Oxycodone	Percocet, Oxycontin	Opiods	CYP2D6	1	ACT	
Oxymorphone	Opana, Numorphan	Opiods	Affected by Multiple Genes	2	INF	

INF: Informative DRUG-GENE ASSOCIATIONS REQUIRING FURTHER INVESTIGATION **ACT**: Actionable ESTABLISHED EVIDENCE-BASED CLINICAL GUIDELINES

Psych Profile Cardiac Profile Comprehensive Only Pain Profile

Generic Name	Trade Name	Specialty	Gene	Evidence		
Piroxicam	Feldene	NSAIDs	CYP2C9	1	ACT	
Sufentanil	Sufenta	Opiods	CYP3A4	2	INF	
SulindacP	Clinoril	NSAIDs	CYP2C9	2	INF	
Tapentadol	Nucynta	Opiods	Affected by Multiple Genes	2	INF	
Tizanidine	Zanaflex	Muscle Relaxants	CYP1A2	2	INF	
Tramadol*P	Ultram	Opiods	CYP2D6	1	ACT	

Psych Profile

Generic Name	Trade Name	Specialty	Gene	Evidence		
Alprazolam	Xanax	Benzopdiazepines	CYP3A4/CYP3A5	2	INF	
Amitriptyline*	Elavil	Antidepressant	CYP2C19/CYP2D6	2	INF	
Amoxapine	Amoxapine	Antidepressant	CYP2D6	2	INF	
Amphetamine	Adderall	Anti-ADHD	Agent COMT	2	INF	
Aripiprazole*	Abilify, Aristada	Antipsychotics	CYP2D6	1	ACT	
Asenapine	Saphris	Antipsychotics	CYP1A2 minor from CYP2D6/CYP3A4	2	INF	
Atomoxetine*	Strattera	Anti-ADHD Agent	CYP2D6	1	ACT	
Brexpiprazole	Rexulti	Antipsychotics	CYP2D6	1	ACT	
Brivaracetam	Briviact	Anticonvulsants	CYP2C9	1	ACT	
BupropionP	Wellbutrin, Zyban, Aplenzin, Contrave	Antiaddictives	ANKK1/DRD2/CYP2B6	2	INF	
Carbamazepine**P	Tegretol, Carbatrol, Epitol	Anticonvulsants	CYP3A4/CYP3A5	2	INF	
Cariprazine	Vraylar	Antipsychotics	CYP3A4 minor from CYP2D6	1	ACT	
Chlorpromazine	Thorazine	Antipsychotic	CYP2D6, CYP3A4	2	INF	
Citalopram*	Celexa	Selective Serotonin Reuptake Inhibitor (SSRI)	CYP2C19	1	ACT	
Clobazam*	Onfi	Benzopdiazepines	CYP2C19	1	ACT	
Clomipramine*	Anafranil	Antidepressant	CYP2C19/CYP2D6	2	INF	
Clonazepam	Klonopin	Benzopdiazepines	CYP3A4	2	INF	
Clonidine	Kapvay	Anti-ADHD Agent	CYP2D6	2	INF	
Clozapine	Clozaril	Antipsychotic	CYP2D6	1	ACT	
Clozapine	Clozaril	Antipsychotic	CYP1A2	2	INF	
Codeine**P	Codeine	Opioid	CYP2D6	1	ACT	
Desipramine*	Norpramin	Antidepressant	CYP2D6	1	ACT	
Desvenlafaxine	Pristiq	Antidepressant	CYP2D6	1	ACT	
Dexmethylphenidate	Focalin	Anti-ADHD Agent	COMT	2	INF	
Dextroamphetamine	Dexedrine	Anti-ADHD Agent	COMT	1	ACT	
Dextromethorphan/ Quinidine*	Nuedexta	Anti-ADHD Agent	CYP2D6	1	ACT	
Diazepam*	Valium	Benzopdiazepines	CYP2C19	2	INF	

INF: Informative DRUG-GENE ASSOCIATIONS REQUIRING FURTHER INVESTIGATION **ACT**: Actionable ESTABLISHED EVIDENCE-BASED CLINICAL GUIDELINES
Psych Profile Cardiac Profile Comprehensive Only Pain Profile

Generic Name	Trade Name	Specialty	Gene	Evidence		
Donepezil	Aricept	Antidementia Agents	CYP2D6	2	INF	●
Doxepin*	Silenor	Antidepressant	CYP2C19/CYP2D6	2	INF	●
Duloxetine	Cymbalta	Antidepressant	CYP2D6	2	INF	●
Escitalopram	Lexapro	SSRI	CYP2C19	1	ACT	●
Eslicarbazepine	Aptiom	Anticonvulsants	NO GENE GUIDED DRUG SELECTION	2	INF	●
Ethosuximide	Zarontin	Anticonvulsants	CYP3A4	2	INF	●
Ezogabine	Potiga	Anticonvulsants	Affected by Multiple Genes	2	INF	●
Felbamate	Felbatol	Anticonvulsants	CYP3A4/CYP2E1	2	INF	●
Fluoxetine*	Prozac, Sarafem	SSRI	CYP2D6	2	INF	●
Fluphenazine	Prolixin	Antipsychotic	CYP2D6	2	INF	●
Fluvoxamine*	Luvox	SSRI	CYP2D6	1	ACT	●
FosphenytoinP	Cerebyx	Anticonvulsants	CYP2C9	2	INF	●
Gabapentin	Neurontin	Anticonvulsants	Affected by Multiple Genes	2	INF	●
Galantamine*	Razadyne	Antidementia Agents	CYP2D6	2	INF	●
Guanfacine	Intuniv	Anti-ADHD Agent	CYP3A4	1	ACT	●
Haloperidol	Haldol	Antipsychotic	CYP2D6	2	INF	●
Iloperidone*	Fanapt	Antipsychotic	CYP2D6	1	ACT	●
Imipramine*	Tofranil	Antidepressant	CYP2C19	2	INF	●
Lacosamide	Vimpat	Anticonvulsants	CYP2C19	1	ACT	●
Lamotrigine	Lamictal	Anticonvulsants	UGT1A4/UGT1A1/UGBT2B7	1	ACT	●
Levetiracetam	Keppra	Anticonvulsants	Affected by Multiple Genes	1	ACT	●
Levomilnacipran	Fetzima	Antidepressant	CYP3A4	2	INF	●
LisdexamfetamineP	Vyvanse	Anti-ADHD Agent	COMT	2	INF	●
Loxapine	Loxitane, Adasuve	Antipsychotic	CYP3A4/CYP2D6/FMO/CYP1A2	2	INF	●
Lurasidone	Latuda	Antipsychotic	CYP3A4	1	ACT	●
Maprotiline	Ludiomil	Antidepressant	CYP2D6	2	INF	●
Memantine	Namenda	Antidementia Agents	Affected by Multiple Genes	2	INF	●
Methylphenidate	Ritalin	Anti-ADHD Agent	COMT	2	INF	●
Mirtazapine	Remeron	Antidepressant	CYP2D6	1	ACT	●
Nefazodone*	Serzone	Antidepressant	CYP2D6	2	INF	●
Nortriptyline*	Pamelor	Antidepressant	CYP2D6	1	ACT	●
Olanzapine	Zyprexa	Antipsychotic	CYP1A2/CYP2D6	1	ACT	●
Oxcarbazepine	Trileptal, Oxtellar XR	Anticonvulsants	Affected by Multiple Genes	1	INF	●
Paliperidone	Invega	Antipsychotics	CYP2D6	1	ACT	●
Paroxetine*	Paxil, Brisdelle	Antidepressant	CYP2D6	1	ACT	●
Perampanel	Fycompa	Anticonvulsants	CYP3A4	2	INF	●
Perphenazine*	Trilafon	Antipsychotics	CYP2D6	1	ACT	●
Phenobarbital	Luminal	Anticonvulsants	CYP2C19	2	INF	●
Phenytoin*	Dilantin	Anticonvulsants	CYP2C9	1	ACT	●
Pimozide*	Orap	Antipsychotics	CYP2D6	1	ACT	●

INF: Informative DRUG-GENE ASSOCIATIONS REQUIRING FURTHER INVESTIGATION **ACT**: Actionable ESTABLISHED EVIDENCE-BASED CLINICAL GUIDELINES

● Psych Profile ● Cardiac Profile ● Comprehensive Only ● Pain Profile

Generic Name	Trade Name	Specialty	Gene	Evidence		
Pregabalin	Lyrica	Anticonvulsants	Affected by Multiple Genes	2	INF	
Pimavanserin	Nuplazid	Antipsychotics	CYP3A4/5	2	INF	
Primidone	Mysoline	Anticonvulsants	CYP2C19	2	INF	
Protriptyline*	Vivactil	Antidepressants	CYP2D6	1	ACT	
Quetiapine	Seroquel	Antipsychotics	CYP3A4/CYP2D6	2	INF	
Risperidone*	Risperdal	Antipsychotics	CYP2D6	1	ACT	
Rufinamide	Banzel	Anticonvulsants	Affected by Multiple Genes	2	INF	
Sertraline	Zoloft	Antidepressants	CYP2C19	2	INF	
Tetrabenazine*	Xenazine	Antipsychotics	CYP2D6	1	ACT	
Thioridazine*	Mellaril	Antipsychotics	CYP2D6	1	ACT	
Thiothixene	Navane	Antipsychotics	CYP3A4 &1A2	2	INF	
Tiagabine	Gabitril	Anticonvulsants	CYP3A4	2	INF	
Topiramate	Topamax	Anticonvulsants	Affected by Multiple Genes	2	INF	
Trazodone	Oleptro	Antipsychotics	CYP3A4	2	INF	
Trifuoperazine	Stelazine	Antipsychotics	Affected by Multiple Genes	2	INF	
Trimipramine*	Surmontil	Antidepressants	CYP2C19/CYP2D6	2	INF	
Valproic Acid**	Depakote, Depakene	Anticonvulsants	CYP2C9, CYP2C19	2	INF	
Venlafaxine*	Effexor	Antidepressants	CYP2D6	1	ACT	
Vigabatrin	Sabril	Anticonvulsants	Affected by Multiple Genes	2	INF	
Vilazodone	Viibryd	Antidepressants	CYP3A4, CPY2C19, 2D6	2	INF	
Vortioxetine*	Trintellix	Antidepressant	CYP2D6	1	ACT	
Ziprasidone	Geodon	Antipsychotics	CYP3A4	2	INF	
Zonisamide	zonegran	Anticonvulsants	CYP2C19	2	INF	

Specially	Condition	Gene	Evidence Level	
Cardiology	Thrombosis	Factor V Leiden	1	
Cardilogy	Thrombosis	Factor II	2	
Cardiology	Hyperhomocysteinemia	MTHFR	2	
Cardiology	Dyslipidemia	APOE	2	
Antipsychotic	Induced Tardive Dyskinesia	DRD2		
Antipsychotic	Induced Hperprolacinemia	DRD2		
Antipsychotic	Induced Weight Gain	DRD2		

* FDA approved information about pharmacogenomics testing is included specifically on the drug information bulletin.
** FDA Approved Black Box Warning for this drug including a recommendation for pharmacogenomics testing is listed.
PThis drug is a prodrug. Prodrugs need to be metabolized into an active form in the body before they can deliver therapeutic effects.

CLINIC/PHYSICIAN INFORMATION

Evidence Level 1: Recommendations extracted from publications by international pharmacogenetic expert groups or regulatory bodies (CPIC, DPWG, FDA, EMEA). Recommendations suitable for implementation in a clinical setting. Guidelines may change as new knowledge arises.
Evidence Level 2: There are insufficient or contradictory findings documenting the impact of a given genetic polymorphism on drug disposition and response. Recommendations are informative and implementation in a clinical setting is optional.

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Pharmacogenomics (PGx) Medical Records Documentation

Fields denoted with an asterisk (*) are required. All other fields are preferred. Medical records documentation should support the medical necessity of a PGx test.

Clinic Information

Clinic Name*: _____

Patient Information

Patient's Name*: _____ DOB*: _____
Weight (lbs)*: _____ Height*: _____ ft _____ in BP*: _____ Pulse*: _____
Chief Complaint*: _____

Medications Information

- Current Medications/Dosage (☐ Check if Attached)*
- Time Spent on Current Medications/Dosage*
- Conditions being Treated*
- Signs and Symptoms of Conditions (Subjective and Objective)*
- Have the Current Medications/Dosage Failed to Treat the Conditions?*
  ☐ Yes ☐ No
  If Yes, potential medications to attempt: _____
  If No, then this test is not medically necessary.
- Select the Potential Medications associated with Aeon Labs' Pharmacogenomics Panel below.*
  If the potential medication is not listed, then this test is not medically necessary.

☐ Acenocoumarol	☐ Dronabinol	☐ Lornoxicam	☐ Quinidine
☐ Amitriptyline	☐ Drospirenone/Ethinyl Estradiol	☐ Lusutrombopag	☐ Quinine Sulfate
☐ Amoxapine	☐ Duloxetine	☐ Meclizine	☐ Rabeprazole
☐ Amphetamine	☐ Efavirenz	☐ Meloxicam	☐ Rimegepant
☐ Arformoterol	☐ Elagolix	☐ Methadone	☐ Risperidone
☐ Aripiprazole	☐ Eliglustat	☐ Metoclopramide	☐ Rivaroxaban
☐ Aripiprazole Lauroxil	☐ Eltrombopag	☐ Metoprolol	☐ Rosuvastatin
☐ Atomoxetine	☐ Erdafitinib	☐ Mirabegron	☐ Rucaparib
☐ Brexpiprazole	☐ Escitalopram	☐ Mirtazapine	☐ Sertraline
☐ Brivaracetam	☐ Esomeprazole	☐ Modafinil	☐ Simvastatin
☐ Bupropion	☐ Fesoterodine	☐ Nebivolol	☐ Siponimod
☐ Cariprazine	☐ Flecainide	☐ Nefazodone	☐ Tacrolimus
☐ Carisoprodol	☐ Flibanserin	☐ Nevirapine	☐ Tamoxifen
☐ Carvedilol	☐ Fluoxetine	☐ Nortriptyline	☐ Tamsulosin
☐ Celecoxib	☐ Flurbiprofen	☐ Oliceridine	☐ Tenoxicam
☐ Cevimeline	☐ Fluvoxamine	☐ Omeprazole	☐ Tetrabenazine
☐ Citalopram	☐ Formoterol	☐ Ondansetron	☐ Thioridazine
☐ Clobazam	☐ Fosphenytoin	☐ Ospemifene	☐ Ticagrelor
☐ Clomipramine	☐ Galantamine	☐ Paliperidone	☐ Timolol
☐ Clopidogrel	☐ Gefitinib	☐ Palonosetron	☐ Tolterodine
☐ Clozapine	☐ Haloperidol	☐ Pantoprazole	☐ Tramadol
☐ Codeine	☐ Hydrocodone	☐ Paroxetine	☐ Trimipramine
☐ Darifenacin	☐ Ibuprofen	☐ Perphenazine	☐ Tropisetron

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☐ Desipramine	☐ Iloperidone	☐ Phenytoin	☐ Umeclidinium
☐ Desvenlafaxine	☐ Imipramine	☐ Pimozide	☐ Upadacitinib
☐ Deutetrabenazine	☐ Labetalol	☐ Piroxicam	☐ Valbenazine
☐ Dexlansoprazole	☐ Lacosamide	☐ Pitolisant	☐ Venlafaxine
☐ Dextromethorphan/Quinidine	☐ Lansoprazole	☐ Prasugrel	☐ Voriconazole
☐ Diazepam	☐ Lesinurad	☐ Propafenone	☐ Vortioxetine
☐ Donepezil	☐ L-methylfolate	☐ Propranolol	☐ Warfarin
☐ Doxepin	☐ Lofexidine	☐ Protriptyline	☐ Zuclopenthixol

- Plan of Action for Test Results*

_____

Patient and Family History

- Personal History of Conditions (☐ Check if Attached)

_____

- Additional Personal History (☐ Check if Attached)

_____

- Family History (☐ Check if Attached)

_____

- Other Support Laboratory Test Results (☐ Check if Attached)

_____

Clinical Notes

- Progress Notes (☐ Check if Attached)

_____

- Consultation Notes (☐ Check if Attached)

_____

- Other Treatment Notes (☐ Check if Attached)

_____

Attestation Statement

By signing below, the ordering provider confirms that the test ordered is medically necessary for the risk assessment, diagnosis, or detection of a disease, illness, impairment, symptom, syndrome, or disorder, and confirms that the ordering provider:

- is the treating clinician who is responsible for the pharmacologic management of the patient's condition
- is considering or has already prescribed a pharmacologic treatment with actionable gene-drug interactions
- understands the actionability of the ordered test
- will use the results in the management of the patient's medical conditions
- will follow up with the patient once the results are received to render additional treatment decision based on the test results
- certifies under penalties of perjury that all local and national CMS coverage guidelines and/or federal screening coverage guidelines of the ordered test have been met

By signing below, I attest that the medical record entry for this patient accurately reflects signature/notations that I made in my capacity as the ordering provider when I treated/diagnosed the above listed patient. I do hereby attest that this information is true, accurate, and complete to the best of my knowledge and I understand that any falsification, omission, or concealment of material fact may subject me to administrative, civil, or criminal liability.

_____	_____	_____
Provider Signature (wet ink)*	Provider Name/Credentials*	Date*

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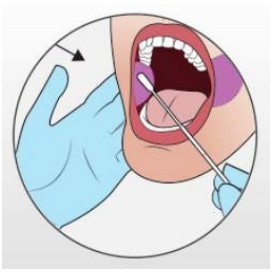
Buccal Swab Collection Protocol

1. Provide Two Buccal Swab to the Patient
Please provide the patient with two buccal collection devices. Label the sample tubes with name, date of birth and collection date.

***Note* Patient should rinse out mouth with water and refrain from eating for 1-2 hours prior to test.**

2. Swab Cheeks
Remove the swab from the collection tube. Have the patient scrub the swab for 45 seconds in a circular motion on the inside of the cheek. It is important to avoid the tongue during this process. Have patient move the swab to the other cheek and scrub in circular motion for an additional 45 seconds. Be sure the patient is applying enough pressure to bend the swab shaft when swabbing.

Right   Left

3. Seal Swab
After cells have been collected on swab, place swab in a labeled 5 mL collection tube and seal the cap. Place the genetic lab order form and copies of the patient's insurance cards/demographics in outer pouch of specimen bag.

4. Prepare for shipment by UPS
Place one or more sealed specimen bags containing buccal swabs and paperwork into UPS Clinical Pack. Seal Clinical Pack by removing the adhesive strip and pressing the opening together. Place the prepaid return label on the outside of the Clinical Pack.

6. Storage and Transport of Specimen
The buccal swab samples should be kept cool (refrigerated) until pick up or overnight shipment. Aeon will store buccal swabs on site for 6 months.

DATA SOURCES

→Problems related to the heart, including heart attacks, congestive heart failure, lifelong heart damage and cardiomyopathy, have been linked to many prescription drugs.
Source: www.drugwatch.com/side-effects/

→Some antipsychotic drugs, including drugs used in Alzheimer's treatment are linked to strokes. Source: : www.alzheimers.org

→Although some adverse drug reactions are not very serious, others cause death, hospitalization, or serious injury of more than 2 million people in the United States each year, including more than 100,000 fatalities. http://www.worstpills.org/public/page.cfm?op_id=4

→Each year, in hospitals alone, there are 28,000 cases of life-threatening heart toxicity from adverse reactions to digoxin, the most commonly used form of digitalis (drugs that regulate the speed and strength of heart beats) in older adults.
http://www.worstpills.org/public/page.cfm?op_id=5

→On December 18, 2015, the Precision Medicine Initiative was adopted. This is a participant-engaged, data-driven research effort at the intersection of human biology, behavior, genetics, environment, data science, and computation aimed at developing more effective ways to improve health and treat disease.

National Center for Complementary and Integrative Health (NCCIH) and the Centers for Disease Control and Prevention (CDC), based on data from a special supplement-on use of complementary health approaches-to the 2012 National Health Interview Survey (NHIS).

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