PrimaHealth

PATIENT INFORMATION		SPECIMEN DETAILS		ORDERED BY
NAME:	JILLIAN DOE	**COLLECTION DATE:**	7/19/2016	DOCTOR JONES
ACC #:	1607190464	**RECEIVED DATE:**	7/19/2016	
DOB:	1/1/1753	**REPORT DATE:**	8/11/2016	1^ABC CLINICAL LAB
SEX:	Female			

Cardiology PGX and DDI Profile

Current Patient Medications

Benicar, Coreg, Plavix, Warfarin, Zocor

Zocor
Simvastatin

Intermediate Myopathy Risk (SLCO1B1: Decreased Function) — ACTIONABLE

Simvastatin plasma concentrations are expected to be elevated. **Consider avoiding simvastatin,** and prescribe an alternative statin or another hypolipidemic drug, or consider prescribing simvastatin at a lower starting dose (20 mg/day). Routine creatine kinase (CK) monitoring is also advised. **The FDA recommends against the 80 mg daily dose.** Although the association between the SLCO1B1 521C>T variant and myopathy risk is not clearly established for other statins such as atorvastatin, pitavastatin, rosuvastatin, and pravastatin, caution is advised if high doses of these statins are used in this patient. Fluvastatin plasma levels are not affected by the SLCO1B1 521C>T variant.

Plavix
Clopidogrel

Increased Response to Clopidogrel (CYP2C19: Ultra-Rapid Metabolizer) — ACTIONABLE

Clopidogrel can be prescribed at standard label-recommended dosage. Individuals with the *17 allele may have an increased risk of bleeding while taking clopidogrel.

Warfarin
Coumadin

Normal Sensitivity to Warfarin (CYP2C9 *1/*1 VKORC1 -1639G>A G/A) — ACTIONABLE

Initiation Therapy: consider using the following standard warfarin dose range as provided in the FDA-approved label: **5-7 mg/day**. OR consider using a personalized dose calculated by a pharmacogenetic algorithm. The estimated time to reach steady state is 4-5 days.

Benicar
Olmesartan

Normal Sensitivity to Olmesartan Medoxomil — ACTIONABLE

Pharmacogenetic guidance: Olmesartan medoxomil is hydrolyzed to olmesartan its active metabolite in the gastrointestinal tract during absorption. There is virtually no further metabolism of olmesartan. Genetic variability of the cytochrome P450 genes is not expected to affect the patient's response to olmesartan medoxomil. No genotype-based dosing adjustments are available.

Coreg
Carvedilol

Normal Sensitivity to Carvedilol (CYP2D6: Normal Metabolizer) — ACTIONABLE

Carvedilol can be prescribed at standard label-recommended dosage and administration. Careful titration is recommended with monitoring until a favorable response is achieved.

Warfarin & Zocor

MODERATE

Patients should be monitored for changes in prothrombin time when a HMG Co-A reductase inhibitor is added to or discontinued from warfarin therapy, or if the dosage of the HMG Co-A reductase inhibitor is adjusted.

Plavix & Warfarin

MODERATE

Use caution when administering platelet aggregation inhibitors concurrently with anticoagulants. Careful monitoring of appropriate laboratory values for the patient's anticoagulant (e.g. PTT for heparin, anti Xa levels for low-molecular weight heparins, INR for warfarin) as well as signs and symptoms of bleeding is warranted. Consider regular monitoring of hemoglobin and/or platelet levels. Instruct patients to report any signs and symptoms of bleeding, such as bleeding from the eyes, gums or nose; unusual bruising; dark stools; red or dark brown urine; and/or abdominal pain or swelling.

Unrecognized Medications: *None*

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Highly elevated risk for indicated condition or adverse drug reaction. Medication can be prescribed with monitoring; alternative therapy may be needed.

Moderately elevated risk for indicated condition or adverse drug reaction. Medication can be prescribed with monitoring; therapy adjustment may be needed.

Typical risk for indicated condition or adverse drug reaction. Medication can be prescribed according to standard dosing guidelines.

PHARMACOGENETIC RESULTS

DRUG-DRUG INTERACTIONS

ACTIONABLE	Recommendations are suitable for implementation in a clinical setting. Recommendations extracted from evidence based guidelines issued by international pharmacogenetic consortia, professional societies or regulatory bodies (CPIC, DPWG, FDA, EMA, CPNDA, ACMG).
INFORMATIVE	Recommendations are informative and implementation in a clinical setting is optional. The evidence documenting these drug-gene associations may be limited or insufficient and may require further investigation. There are no established evidence based guidelines issued by international pharmacogenetic consortia, professional societies or regulatory bodies.
MODERATE	Drug interactions of moderate severity. The clinician should assess the patient's characteristics and take action as needed.
SERIOUS	Severe drug interaction or contraindicated drug combination which may produces serious consequences in most patients. This drug combination generally should not be dispensed or administered to the same patient. Action is required to reduce risk of severe adverse interaction.

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Risk Management

Hyperlipidemia/Atherosclerotic Cardiovascular Disease

Increased risk of hyperlipidemia/atherosclerotic vascular disease

The patient is positive for the APOE 388 T>C (Arg112Cys) mutation and negative for the 526 C>T (Cys158Arg) mutation. The patient's genotype is ε3/ε4 (frequency: 15-28%). The APOE E3 is the normal APOE. The APOE E4 confers a limitation of HDL binding to its receptor, and is associated with increased plasma cholesterol, LDL, and triglycerides.

The ε4 allele is associated with an increased risk of hyperlipidemia/atherosclerotic vascular disease, and individuals that are heterozygous for this allele may have higher total cholesterol levels and elevated LDL cholesterol levels.

Consider dietary adjustment (very low fat diet) and statins (or HMG-CoA reductase inhibitors).

Thrombophilia

No Increased Risk of Thrombosis

The patient does not carry the Factor V Leiden G1691A mutation or Factor II G20210A mutation (wild-type).

The patient's risk of thrombosis is not increased (average risk of clotting is about 1 in 1000 for anyone in a year). However, because this test cannot find all of the inherited reasons for abnormal clotting, other factors may affect this risk assessment.

Unless other genetic and/or circumstantial risk factors are present (e.g., smoking or obesity...), estrogen-containing contraceptive and hormone replacement therapy can be used by the patient.

Hyperhomocysteinemia - Thrombosis

No Increased Risk of Hyperhomocysteinemia

The patient does not carry the MTHFR C677T or MTHFR A1298C mutation (wild-type). MTHFR enzyme activity is normal.

With a normal MTHFR activity, this patient is unlikely to have elevated plasma levels of homocysteine, which is a known risk factor for cardiovascular diseases and thrombosis. Unless other risk factors are present, the patient is not expected to have an increased risk for venous thromboembolism (VTE).

MTHFR enzyme activity is normal.

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Potentially Impacted Medications

CLASS	DRUG*	PHARMACOGENETIC RESULTS ✓	⚠	⊗	INTERACTING DRUGS
Angiotensin II Receptor Antagonists	Azilsartan (Edarbi, Edarbyclor)	●			
	Candesartan (Atacand)	●			
	Eprosartan (Teveten)	●			
	Irbesartan (Avapro)	●			
	Losartan (Cozaar, Hyzaar)	●			
	Olmesartan (Benicar)	●			
	Telmisartan (Micardis)	●			
	Valsartan (Diovan, Entresto)	●			
Antianginal Agents	Ranolazine (Ranexa)	●			⚠ Zocor
Antiarrhythmics	Flecainide (Tambocor)	●			
	Mexiletine (Mexitil)	●			
	Propafenone (Rythmol)	●			⚠ Warfarin
Anticoagulants	*Apixaban (Eliquis)*	●			⊗ Plavix ⊗ Warfarin
	Dabigatran Etexilate (Pradaxa)	●			⚠ Coreg ⊗ Plavix ⊗ Warfarin
	Edoxaban (Savaysa)	●			⊗ Plavix ⊗ Warfarin
	Fondaparinux (Arixtra)	●			⚠ Plavix ⚠ Warfarin
	Rivaroxaban (Xarelto)	●			⊗ Plavix ⊗ Warfarin
	Warfarin (Coumadin)		●		⚠ Plavix ⚠ Zocor
Antiplatelets	**Clopidogrel (Plavix)**		●		⚠ Warfarin
	Prasugrel (Effient)	●			⚠ Warfarin
	Ticagrelor (Brilinta)	●			⚠ Warfarin ⊗ Zocor
	Vorapaxar (Zontivity)	●			⚠ Warfarin

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CLASS	DRUG*	PHARMACOGENETIC RESULTS ✓	⚠	⊗	INTERACTING DRUGS
Beta Blockers	**Carvedilol (Coreg)**	●			
	Labetalol (Normodyne, Trandate)	●			
	Metoprolol (Lopressor)	●			
	Nebivolol (Bystolic)	●			
	Propranolol (Inderal)	●			⚠ Warfarin
	Timolol (Timoptic)	●			
Diuretics	Torsemide (Demadex)	●			⚠ Benicar
Statins	Atorvastatin (Lipitor)		●		
	Fluvastatin (Lescol)	●			⚠ Warfarin
	Lovastatin (Mevacor, Altoprev, Advicor)		●		⚠ Warfarin
	Pitavastatin (Livalo)		●		
	Pravastatin (Pravachol)		●		
	Rosuvastatin (Crestor)		●		⚠ Warfarin
	Simvastatin (Zocor)			●	⚠ Warfarin

*Current patient medications are listed in bold whereas italicized drug names indicate drugs with no pharmacogenetic guidance

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Dosing Guidance

Apixaban (Eliquis)

Normal Response to Apixaban

INFORMATIVE

Pharmacogenetic guidance: Apixaban is not extensively metabolized and only ~20% of the dose is metabolized primarily by CYP3A4 and CYP3A5, with minor contributions from CYP1A2 and CYP2J2. This drug is a substrate for the efflux transport proteins P-gp (ABCB1) and BCRP (ABCG2). While these enzymes and transporters are polymorphic, genetic variations are unlikely to have a clinically significant impact on apixaban exposure, and no genotype-based dosing adjustments are recommended. **Polypharmacy guidance:** Exposure to apixaban increases by 100% when co-administered with ketoconazole, a strong CYP3A/P-gp inhibitor. This translates into an increased bleeding risk (70% increase). Hence, for patients receiving 5 mg twice daily, apixaban dose should be decreased to 2.5 mg twice daily when it is coadministered with drugs that are strong dual inhibitors of CYP3A4 and P-gp (e.g., ketoconazole, itraconazole, ritonavir, and clarithromycin). In patients already taking 2.5 mg twice daily, coadministration of apixaban with strong dual inhibitors of CYP3A4 and P-gp should be avoided. No dose adjustment is recommended when co-administered with moderate inhibitors. Co-administration with rifampin, a strong CYP3A/P-gp inducer, results in halving of exposure to apixaban. There is no clinical experience at these reduced exposures. Hence, concomitant administration of strong CYP3A/P-gp inducers should be avoided.

Atorvastatin (Lipitor)

Increased Myopathy Risk (SLCO1B1: Decreased Function)

INFORMATIVE

The reduced SLCO1B1 function may result in elevated atorvastatin plasma levels. Because the risk of myopathy increases in patients with high statin plasma levels, the use of high atorvastatin doses in this patient should be avoided. If atorvastatin is used in this patient, a closer monitoring of serum creatine kinase and liver function is recommended. Other myopathy predisposing factors include advanced age (≥65), uncontrolled hypothyroidism, renal impairment, comedications, and female gender.

Azilsartan (Edarbi, Edarbyclor)

Normal Sensitivity to Azilsartan Medoxomil (CYP2C9: Normal Metabolizer)

INFORMATIVE

Azilsartan medoxomil is hydrolyzed to azilsartan, its active metabolite, in the gastrointestinal tract during absorption. Azilsartan is further metabolized to inactive metabolites by CYP2C9. Consider standard label-recommended dosage and administration.

Benicar

Benicar & Torsemide

MODERATE

In patients without heart failure, it may be advisable to discontinue the diuretic, reduce the dose of the diuretic, or increase salt intake prior to the initiation of the ACE inhibitor. If hypotension occurs, place the patient in a supine position. Hypotension is most likely when the ACE inhibitor is initiated. However, if subsequent hypotension occurs, a dosage adjustment or discontinuation of one agent may be required.Intravascular volume depletion should be corrected in patients prior to the initiation of an angiotensin II receptor antagonist.

Normal Sensitivity to Olmesartan Medoxomil

ACTIONABLE

Pharmacogenetic guidance: Olmesartan medoxomil is hydrolyzed to olmesartan its active metabolite in the gastrointestinal tract during absorption. There is virtually no further metabolism of olmesartan. Genetic variability of the cytochrome P450 genes is not expected to affect the patient's response to olmesartan medoxomil. No genotype-based dosing adjustments are available.

Candesartan (Atacand)

Normal Sensitivity to Candesartan Cilexetil

ACTIONABLE

Pharmacogenetic guidance: Candesartan cilexetil is hydrolyzed to candesartan its active metabolite in the gastrointestinal tract during absorption. Candesartan undergoes minor hepatic metabolism by O-deethylation to an inactive metabolite. Genetic variability of the cytochrome P450 genes is not expected to affect the patient's response to candesartan cilexetil. No genotype-based dosing adjustments are available.

Coreg

Coreg & Dabigatran Etexilate

MODERATE

Assess renal function and evaluate patient for other pre-existing risk factors for bleeding prior to initiating concurrent therapy. The concurrent use of dabigatran and P-gp inhibitors should be avoided in atrial fibrillation patients with severe renal impairment (CrCl less than 30 ml/min) and in patients being treated for or undergoing prophylaxis for DVT or PE with moderate renal impairment (CrCl less than 50 ml/min).While the US manufacturer of dabigatran states that no dosage adjustment is necessary in other patients, the Canadian and UK manufacturer of dabigatran recommends that the dose of dabigatran be reduced from 220 mg daily to 150 mg daily for the prevention of VTE after total hip replacement or total knee replacement.Careful monitoring for signs and symptoms of bleeding is warranted during concurrent therapy. Consider regular monitoring of hemoglobin, platelet levels, and/or activated partial thromboplastin time (aPTT) or ecarin clotting time (ECT). Instruct patients to report any signs and symptoms of bleeding, such as bleeding from the eyes, gums or nose; unusual bruising; dark stools; red or dark brown urine; and/or abdominal pain or swelling.The interaction with verapamil can be minimized by taking dabigatran 2 hours prior to verapamil dose.

Normal Sensitivity to Carvedilol (CYP2D6: Normal Metabolizer)

ACTIONABLE

Carvedilol can be prescribed at standard label-recommended dosage and administration. Careful titration is recommended with monitoring until a favorable response is achieved.

Dabigatran Etexilate (Pradaxa)

Normal Response to Dabigatran

INFORMATIVE

Pharmacogenetic guidance: Dabigatran is eliminated primarily unchanged by the kidneys. After oral administration, dabigatran etexilate is converted to its active form dabigatran by esterases. A small portion (20%) of dabigatran dose is also conjugated to form pharmacologically active acyl glucuronides. Dabigatran is not a substrate, inhibitor, or inducer of CYP450 enzymes. Dabigatran etexilate is a substrate of the efflux transporter P-gp (ABCB1). Common genetic polymorphism of the ABCB1 gene (2677G>T/A and 3435 C>T) do not appear to affect dabigatran exposure. **Polypharmacy guidance:** *1-Reduction in Risk of Stroke and Systemic Embolism in Non-valvular AF*: In patients with moderate renal impairment (CrCl 30-50 mL/min), concomitant use of the P-gp inhibitor dronedarone or systemic ketoconazole can be expected to produce dabigatran exposure similar to that observed in severe renal impairment. Consider reducing the dose of dabigatran to 75 mg twice daily. Dose adjustment is not necessary when coadministered with other P-gp inhibitors. In patients with CrCl<30 mL/min, avoid use of concomitant P-gp inhibitors with dabigatran. *2-Treatment of DVT and PE Reduction in the Risk of Recurrence of DVT and PE*: Avoid use of concomitant P-gp inhibitors with dabigatran in patients with CrCl <50 mL/min.

Edoxaban (Savaysa)

Normal Response to Edoxaban

INFORMATIVE

Pharmacogenetic guidance: Edoxaban is eliminated primarily as unchanged drug in urine. There is minimal metabolism via hydrolysis (mediated by carboxylesterase 1), conjugation, and oxidation by CYP3A4. Edoxaban is a substrate of the efflux transporter P-gp and its active metabolite (formed by carboxylesterase 1) is a substrate of the uptake transporter SLCO1B1. Preliminary studies indicate that the 521C single nucleotide polymorphism (rs4149056) of the SLCO1B1 gene does not affect edoxaban pharmacokinetics. **Polypharmacy guidance:** Avoid the concomitant use of edoxaban with rifampin. No dose reduction is recommended for concomitant P-gp inhibitor use.

Eprosartan (Teveten)

Normal Sensitivity to Eprosartan

ACTIONABLE

Pharmacogenetic guidance: Eprosartan is eliminated by biliary and renal excretion, primarily as unchanged compound. Eprosartan is not metabolized by the cytochrome P450 enzymes. Genetic variability of the cytochrome P450 genes is not expected to affect the patient's response to eprosartan. No genotype-based dosing adjustments are available.

Flecainide (Tambocor)

Normal Sensitivity to Flecainide (CYP2D6: Normal Metabolizer)

ACTIONABLE

Flecainide can be prescribed at standard label-recommended dosage and administration. No action is needed besides the standard precautions.

Fluvastatin (Lescol)

Normal Myopathy Risk (SLCO1B1: Decreased Function)

INFORMATIVE

Fluvastatin plasma concentrations are not expected to increase, and unless other genetic or circumstantial risk factors are present, fluvastatin can be prescribed at standard FDA-recommended starting doses and adjusted based on disease-specific guidelines. (Other myopathy predisposing factors include advanced age (≥65), uncontrolled hypothyroidism, renal impairment, high statin dose, comedications, and female gender.)

Normal Sensitivity to Fluvastatin (CYP2C9: Normal Metabolizer)

ACTIONABLE

Fluvastatin plasma concentrations are not expected to increase, and unless other genetic or circumstantial risk factors are present, fluvastatin can be prescribed at standard FDA-recommended starting doses and adjusted based on disease-specific guidelines. Other adverse events and predisposing factors include advanced age (≥65), diabetes, hypothyroidism, renal or hepatic impairments, high statin dose, CYP2C9 inhibitors, ABCG2 inhibitors, and female gender.

Fondaparinux (Arixtra)

Normal Response to Fondaparinux

INFORMATIVE

Pharmacogenetic guidance: Fondaparinux is eliminated unchanged through renal excretion and is not metabolized by CYPs, and therefore genetic variations in these metabolizing enzymes are not expected to affect its efficacy or toxicity profiles. no genetically guided drug selection or dosing recommendations are available. **Polypharmacy guidance:** The concomitant use of fondaparinux with aspirin or NSAIDS may enhance the risk of hemorrhage. Discontinue agents that may enhance the risk of hemorrhage prior to initiation of therapy with fondaparinux unless essential. If co-administration is necessary, monitor patients closely for hemorrhage.

Irbesartan (Avapro)

Normal Sensitivity to Irbesartan (CYP2C9: Normal Metabolizer)

INFORMATIVE

Irbesartan can be prescribed at standard label-recommended dosage and administration.

Labetalol (Normodyne, Trandate)

Normal Response to Labetalol

INFORMATIVE

Pharmacogenetic guidance: Labetalol is extensively metabolized by UGT2B7, UGT1A1, and CYP2C19 to inactive metabolites. Preliminary studies indicate that following a single 200-mg oral dose, labetalol plasma concentrations are 2.9-fold higher in Chinese individuals with the CYP2C19 *2/*2 genotype than those with the CYP2C19 *1/*1 genotype. The clinical impact of this change is unknown. **Polypharmacy guidance:** Cimetidine increases the bioavailability of labetalol, and clinical monitoring is advised when both drugs are coadministered.

Losartan (Cozaar, Hyzaar)

Normal Response to Losartan (CYP2C9: Normal Metabolizer)

INFORMATIVE

Losartan is metabolized to its active metabolite by CYP2C9 and CYP3A4. The patient's genotype predicts a normal exposure to losartan and its active metabolite. Losartan can be prescribed at label-recommended dosage and administration.

Lovastatin (Mevacor, Altoprev, Advicor)

Increased Myopathy Risk (SLCO1B1: Decreased Function)

INFORMATIVE

The reduced SLCO1B1 function may result in elevated lovastatin acid plasma levels. Because the risk of myopathy increases in patients with high statin plasma levels, the use of high lovastatin doses in this patient should be avoided. If lovastatin is used in this patient, a closer monitoring of serum creatine kinase and liver function is recommended. Other myopathy predisposing factors include advanced age (≥65), uncontrolled hypothyroidism, renal impairment, comedications, and female gender.

Metoprolol (Lopressor)

Normal Sensitivity to Metoprolol (CYP2D6: Normal Metabolizer)

ACTIONABLE

Metoprolol can be prescribed at standard label-recommended dosage and administration. Selection of proper dosage requires individual titration.

Mexiletine (Mexitil)

Normal Sensitivity to Mexiletine (CYP2D6: Normal Metabolizer)

ACTIONABLE

Mexiletine can be prescribed at standard label-recommended dosage. A careful titration with ECG recording and monitoring of mexiletine plasma concentrations are recommended until a favorable clinical response is achieved.

Nebivolol (Bystolic)

Normal Sensitivity to Nebivolol (CYP2D6: Normal Metabolizer)

ACTIONABLE

Nebivolol can be prescribed at standard label-recommended dosage and administration. Caution is recommended during up-titration until a favorable response is achieved.

Pitavastatin (Livalo)

Increased Myopathy Risk (SLCO1B1: Decreased Function)

INFORMATIVE

The reduced SLCO1B1 function may result in elevated pitavastatin plasma levels. Because the risk of myopathy increases in patients with high statin plasma levels, the use of high pitavastatin doses in this patient should be avoided. If pitavastatin is used in this patient, a closer monitoring of serum creatine kinase and liver function is recommended. Other myopathy predisposing factors include advanced age (≥65), uncontrolled hypothyroidism, renal impairment, comedications, and female gender.

Plavix

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Increased Response to Clopidogrel (CYP2C19: Ultra-Rapid Metabolizer)

ACTIONABLE

Clopidogrel can be prescribed at standard label-recommended dosage. Individuals with the *17 allele may have an increased risk of bleeding while taking clopidogrel.

Plavix & Apixaban

SERIOUS

Patients requiring concurrent therapy with apixaban and an antiplatelet agent should be closely monitored for signs of bleeding.Monitor patients receiving concurrent therapy for signs of blood loss, including decreased hemoglobin, hematocrit, fecal occult blood, and/or decreased blood pressure and promptly evaluate patients with any symptoms.When applicable, perform agent-specific laboratory test (e.g. INR, aPTT) to monitor efficacy and safety of anticoagulation. Discontinue anticoagulation in patients with active pathologic bleeding.Instruct patients to report any signs and symptoms of bleeding, such as unusual bleeding from the gums or nose; unusual bruising; red or black, tarry stools; red, pink or dark brown urine; acute abdominal or joint pain and/or swelling.Discontinue apixaban in patients with active bleeding.

Plavix & Dabigatran Etexilate

SERIOUS

Patients requiring concurrent therapy with dabigatran and an antiplatelet agent should be closely monitored for signs of bleeding.Monitor patients receiving concurrent therapy for signs of blood loss, including decreased hemoglobin, hematocrit, fecal occult blood, and/or decreased blood pressure and promptly evaluate patients with any symptoms.Discontinue dabigatran in patients with active bleeding.

Plavix & Edoxaban

SERIOUS

Patients requiring concurrent therapy with edoxaban and an antiplatelet agent should be closely monitored for signs of bleeding.Monitor patients receiving concurrent therapy for signs of blood loss, including decreased hemoglobin, hematocrit, fecal occult blood, and/or decreased blood pressure and promptly evaluate patients with any symptoms.When applicable, perform agent-specific laboratory test (e.g. INR, aPTT) to monitor efficacy and safety of anticoagulation. Discontinue anticoagulation in patients with active pathologic bleeding.Instruct patients to report any signs and symptoms of bleeding, such as unusual bleeding from the gums or nose; unusual bruising; red or black, tarry stools; red, pink or dark brown urine; acute abdominal or joint pain and/or swelling.Discontinue edoxaban in patients with active bleeding.

Plavix & Fondaparinux

MODERATE

Use caution when administering platelet aggregation inhibitors concurrently with anticoagulants. Careful monitoring of appropriate laboratory values for the patient's anticoagulant (e.g. PTT for heparin, anti Xa levels for low-molecular weight heparins, INR for warfarin) as well as signs and symptoms of bleeding is warranted. Consider regular monitoring of hemoglobin and/or platelet levels. Instruct patients to report any signs and symptoms of bleeding, such as bleeding from the eyes, gums or nose; unusual bruising; dark stools; red or dark brown urine; and/or abdominal pain or swelling.

Plavix & Rivaroxaban

SERIOUS

Avoid concurrent use of rivaroxaban and clopidogrel unless the benefit is expected to outweigh the increased risk of bleeding.Avoid concurrent use of rivaroxaban and higher doses of aspirin unless the benefit is expected to outweigh the increased risk of bleeding. In the ROCKET AF trial, concomitant use of low dose aspirin (almost exclusively at less than or = to 100 mg daily) was identified as an independent risk factor for bleeding.Monitor patients receiving concurrent therapy for signs of blood loss, including decreased hemoglobin, hematocrit, fecal occult blood, and/or blood pressure and promptly evaluate patients with any symptoms. Discontinue rivaroxaban in patients with active pathological bleeding.When applicable, perform agent-specific laboratory test (e.g. INR, aPTT) to monitor efficacy and safety of anticoagulation. Discontinue anticoagulation in patients with active pathologic bleeding.Instruct patients to report any signs and symptoms of bleeding, such as unusual bleeding from the gums or nose; unusual bruising; red or black, tarry stools; red, pink or dark brown urine; acute abdominal or joint pain and/or swelling.

Plavix & Warfarin

MODERATE

Use caution when administering platelet aggregation inhibitors concurrently with anticoagulants. Careful monitoring of appropriate laboratory values for the patient's anticoagulant (e.g. PTT for heparin, anti Xa levels for low-molecular weight heparins, INR for warfarin) as well as signs and symptoms of bleeding is warranted. Consider regular monitoring of hemoglobin and/or platelet levels. Instruct patients to report any signs and symptoms of bleeding, such as bleeding from the eyes, gums or nose; unusual bruising; dark stools; red or dark brown urine; and/or abdominal pain or swelling.

Prasugrel (Effient)

Normal Response to Prasugrel (CYP2C19: Ultra-Rapid Metabolizer)

ACTIONABLE

Prasugrel is a prodrug that is hydrolyzed in the intestine to a thiolactone, which is then converted to the active metabolite primarily by CYP3A4 and CYP2B6, and to a lesser extent by CYP2C9 and CYP2C19. Prasugrel active metabolite exposure and platelet reactivity are not affected by CYP2C19 metabolizer status.

Pravastatin (Pravachol)

Increased Myopathy Risk (SLCO1B1: Decreased Function)

INFORMATIVE

The reduced SLCO1B1 function may result in elevated pravastatin plasma levels. Because the risk of myopathy increases in patients with high statin plasma levels, the use of high pravastatin doses in this patient should be avoided. If pravastatin is used in this patient, a closer monitoring of serum creatine kinase and liver function is recommended. Other myopathy predisposing factors include advanced age (≥65), uncontrolled hypothyroidism, renal impairment, comedications, and female gender.

Propafenone (Rythmol)

Normal Sensitivity to Propafenone (CYP2D6: Normal Metabolizer)

ACTIONABLE

Propafenone can be prescribed at standard label-recommended dosage and administration. Careful titration is recommended with ECG monitoring until a favorable response is achieved.

Propranolol (Inderal)

Normal Sensitivity to Propranolol (CYP2D6: Normal Metabolizer)

ACTIONABLE

Propranolol can be prescribed at standard label-recommended dosage and administration. Careful titration is recommended with monitoring until a favorable response is achieved.

Ranolazine (Ranexa)

Normal Sensitivity to Ranolazine (CYP2D6: Normal Metabolizer)

ACTIONABLE

Ranolazine is metabolized mainly by CYP3A4, and to a lesser extent by CYP2D6. This drug can be prescribed at standard label-recommended dosage and administration. The recommended initial dose is 375 mg twice daily. After 2–4 weeks, the dose should be titrated to 500 mg twice daily, and according to the patient's response, further titrated to a recommended maximum dose of 1000 mg twice daily.

If patient experiences treatment-related adverse events (e.g. dizziness, nausea, vomiting, or syncope), down titration of ranolazine to 500 or 375 mg twice daily may be required. If symptoms do not resolve after dose reduction, treatment should be discontinued.

Ranolazine is a QTc prolonging drug. Caution should be observed when treating: 1- patients with a history of congenital or a family history of long QT syndrome, 2- patients with known acquired QT interval prolongation, and 3- patients treated with drugs affecting the QTc interval. Administration of CYP3A4 inhibitors increases the exposure of ranolazine significantly. As a consequence, the QTc prolongation by ranolazine in the presence of potent CYP3A inhibitors is significantly elevated relative to when the drug is administered alone.

Rivaroxaban (Xarelto)

Normal Response to Rivaroxaban

INFORMATIVE

Pharmacogenetic guidance: Rivaroxaban is metabolized by CYP3A4, CYP3A5, and CYP2J2. It is also a substrate for P-gp (ABCB1) and BCRP (ABCG2) transporters. Genetic polymorphisms of these genes are not expected to affect the efficacy or safety profiles of rivaroxaban. **Polypharmacy guidance:** Avoid concomitant use of rivaroxaban with combined P-gp and strong CYP3A4 inhibitors (e.g., ketoconazole, itraconazole, lopinavir/ritonavir, ritonavir, indinavir, and conivaptan). Avoid concomitant use of rivaroxaban with drugs that are combined P-gp and strong CYP3A4 inducers (e.g., carbamazepine, phenytoin, rifampin, and St. John's wort). Patients with renal impairment coadministered rivaroxaban with drugs classified as combined P-gp and moderate CYP3A4 inhibitors (e.g., diltiazem, verapamil, dronedarone, and erythromycin) have increased exposure compared with patients with normal renal function and no inhibitor use. Significant increases in rivaroxaban exposure may increase bleeding risk.

Rosuvastatin (Crestor)

Increased Myopathy Risk (SLCO1B1 521T>C TC)

INFORMATIVE

The reduced SLCO1B1 function may result in elevated rosuvastatin plasma levels. Because the risk of myopathy increases in patients with high statin plasma levels, the use of high rosuvastatin doses in this patient should be avoided. If rosuvastatin is used in this patient, a closer monitoring of serum creatine kinase and liver function is recommended. Other myopathy predisposing factors include advanced age (≥65), uncontrolled hypothyroidism, renal impairment, comedications, and female gender.

Telmisartan (Micardis)

Normal Sensitivity to Telmisartan

ACTIONABLE

Pharmacogenetic guidance: Telmisartan is metabolized by conjugation to form a pharmacologically inactive acyl glucuronide. Telmisartan is not metabolized by the cytochrome P450 isoenzymes. Genetic variability of the cytochrome P450 genes is not expected to affect the patient's response to telmisartan. No genotype-based dosing adjustments are available.

Ticagrelor (Brilinta)

Normal Response to Ticagrelor (CYP3A5: Poor Metabolizer)

INFORMATIVE

Ticagrelor can be prescribed at standard label-recommended dosage and administration. Careful monitoring is recommended until a favorable response is achieved.

Timolol (Timoptic)

Normal Sensitivity to Timolol (CYP2D6: Normal Metabolizer)

ACTIONABLE

Timolol can be prescribed at standard label-recommended dosage and administration.

Torsemide (Demadex)

Normal Response to Torsemide (CYP2C9: Normal Metabolizer)

INFORMATIVE

The patient's genotype predicts a normal exposure to torsemide and this drug can be prescribed at label-recommended dosage and administration.

Valsartan (Diovan, Entresto)

PrimaHealth

PATIENT INFORMATION		SPECIMEN DETAILS		ORDERED BY
NAME:	JILLIAN DOE	**COLLECTION DATE:**	7/19/2016	DOCTOR JONES
ACC #:	1607190464	**RECEIVED DATE:**	7/19/2016	
DOB:	1/1/1753	**REPORT DATE:**	8/11/2016	1^ABC CLINICAL LAB
SEX:	Female			

Normal Sensitivity to Valsartan

ACTIONABLE

Pharmacogenetic guidance: Valsartan is excreted largely as unchanged compound. CYP2C9 is responsible for the formation of a minor metabolite, valeryl 4-hydroxy valsartan, which accounts for about 9% of a dose. Given the limited contribution of CYP2C9 in the overall disposition of valsartan, genetic variability of the CYP2C9 gene is not expected to affect the patient's response to valsartan. No genotype-based dosing adjustments are available.

Vorapaxar (Zontivity)

Normal Response to Vorapaxar

ACTIONABLE

Pharmacogenetic guidance: vorapaxar is metabolized primarily by CYP3A4, with contribution from CYP2J2. Genetic polymorphisms of these genes are not expected to affect the efficacy or safety profiles of this drug. Vorapaxar is contraindicated in people who have had a stroke, transient ischemic attack (TIA), or intracranial hemorrhage, (ICH) because of the increased bleeding risk. **Polypharmacy guidance:** Avoid concomitant use of vorapaxar with strong CYP3A4 inhibitors (e.g., ketoconazole, itraconazole, lopinavir/ritonavir, ritonavir, indinavir, and conivaptan). Significant increases in vorapaxar exposure may increase bleeding risk. Avoid concomitant use with drugs that are strong CYP3A4 inducers (e.g., carbamazepine, phenytoin, rifampin, and St. John's wort).

Warfarin (Coumadin)

Normal Sensitivity to Warfarin (CYP2C9 *1/*1 VKORC1 -1639G>A G/A)

ACTIONABLE

Initiation Therapy: consider using the following standard warfarin dose range as provided in the FDA-approved label: **5-7 mg/day**. OR consider using a personalized dose calculated by a pharmacogenetic algorithm. The estimated time to reach steady state is 4-5 days.

Warfarin & Apixaban

SERIOUS

The long-term use of concurrent therapy with Direct Oral Anticoagulants (DOACs) and other anticoagulants is generally considered contraindicated. However, overlap may be necessary when switching therapy from one agent to another in order to prevent thrombotic events. Manufacturer recommendations concerning overlap (if any) and timing of discontinuation versus initiation vary depending upon which agent is being discontinued and initiated. Refer to current prescribing information for both agents for additional details.Monitor patients receiving concurrent therapy for signs of blood loss, including decreased hemoglobin, hematocrit, fecal occult blood, and/or decreased blood pressure and promptly evaluate patients with any symptoms. Discontinue apixaban in patients with active bleeding.Concurrent use of apixaban and heparins (including low-molecular weight), factor Xa inhibiting oligosaccharides, GPIIb/IIIa receptor antagonists, thienopyridines, dipyridamole, dextran, vitamin K antagonists, and other oral anticoagulants increases risk of bleeding and is not recommended.When converting from warfarin to apixaban, discontinue warfarin and begin apixaban when the international normalized ratio (INR) is below 2.0.Apixaban affects INR, therefore concurrent administration with warfarin when converting from apixaban to warfarin is not useful in determining target warfarin dose. If continuous anticoagulation is warranted, discontinue apixaban and begin both warfarin and a parenteral anticoagulant when next dose of apixaban is due. Once INR is within range, discontinue the parenteral anticoagulant.When converting between apixaban and anticoagulants other than warfarin, discontinue current anticoagulant and begin new one when next dose is due.

Warfarin & Clopidogrel

MODERATE

Use caution when administering platelet aggregation inhibitors concurrently with anticoagulants. Careful monitoring of appropriate laboratory values for the patient's anticoagulant (e.g. PTT for heparin, anti Xa levels for low-molecular weight heparins, INR for warfarin) as well as signs and symptoms of bleeding is warranted. Consider regular monitoring of hemoglobin and/or platelet levels. Instruct patients to report any signs and symptoms of bleeding, such as bleeding from the eyes, gums or nose; unusual bruising; dark stools; red or dark brown urine; and/or abdominal pain or swelling.

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SEX:	Female			

Warfarin & Dabigatran Etexilate

SERIOUS

The long-term use of concurrent therapy with Direct Oral Anticoagulants (DOACs) and other anticoagulants is generally considered contraindicated. However, overlap may be necessary when switching therapy from one agent to another in order to prevent thrombotic events. Manufacturer recommendations concerning overlap (if any) and timing of discontinuation versus initiation vary depending upon which agent is being discontinued and initiated. Refer to current prescribing information for both agents for additional details.Monitor patients receiving concurrent therapy for signs of blood loss, including decreased hemoglobin, hematocrit, decreased blood pressure and/or fecal occult blood and promptly evaluate patients with any symptoms. Discontinue dabigatran in patients with active bleeding.The UK manufacturer of dabigatran states the use of dabigatran concomitantly used with other anticoagulants, platelet inhibitors, or dextran is contraindicated unless switching treatment to or from dabigatran.When converting from warfarin to dabigatran, discontinue warfarin and begin dabigatran when the patient's INR is below 2.0.When converting from dabigatran to warfarin, start warfarin: -----3 days before discontinuing dabigatran in patients with CrCl greater than 50 ml/min, -----2 days before discontinuing dabigatran in patients with CrCl of 31 ml/min to 50 ml/min, -----1 day before discontinuing dabigatran in patients with CrCl of 15 ml/min to 30 ml/min.There is no recommendation available for converting dabigatran to warfarin in patients with CrCl less than 15 ml/min.When converting from parenteral anticoagulant to dabigatran, administer dabigatran 0-2 hours before the next dose of the parenteral drug is due.When converting from dabigatran to a parenteral anticoagulant, begin parenteral anticoagulant: -----12 hours after last dose of dabigatran in patients with CrCl greater than or equal to 30ml/min, -----24 hours after last dose of dabigatran in patients with CrCl less than 30 ml/min.

Warfarin & Edoxaban

SERIOUS

The long-term use of concurrent therapy with Direct Oral Anticoagulants (DOACs) and other anticoagulants is generally considered contraindicated. However, overlap may be necessary when switching therapy from one agent to another in order to prevent thrombotic events. Manufacturer recommendations concerning overlap (if any) and timing of discontinuation versus initiation vary depending upon which agent is being discontinued and initiated. Refer to current prescribing information for both agents for additional details.Monitor patients receiving concurrent therapy for signs of blood loss, including decreased hemoglobin, hematocrit, fecal occult blood, and/or decreased blood pressure and promptly evaluate patients with any symptoms. Discontinue edoxaban in patients with active bleeding.Edoxaban manufacturer recommendations when converting from another anticoagulant to edoxaban:- When converting from warfarin or other vitamin K antagonists, discontinue warfarin and start edoxaban when the INR is less than or = to 2.5- When converting from other (non-vitamin K antagonist) oral anticoagulants, discontinue current oral anticoagulant and start edoxaban at the time of the next scheduled dose of the other oral anticoagulant.- When converting from a low molecular weight heparin (LMWH), start edoxaban at the time of the next scheduled administration of LMWH.- When converting from unfractionated heparin, discontinue the infusion and start edoxaban 4 hours later.Edoxaban manufacturer recommendations when converting from edoxaban to another anticoagulant:- When converting from edoxaban to warfarin, for patients taking 60 mg of edoxaban, reduce the dose to 30 mg and begin warfarin concomitantly. For patients receiving 30 mg of edoxaban, reduce the dose to 15 mg and begin warfarin concomitantly. INR must be measured at least weekly and just prior to the daily dose of edoxaban to minimize the effects of edoxaban on INR measurement. Once a stable INR = or > 2.0 is achieved, edoxaban should be discontinued and the warfarin continued.- A second edoxaban to warfarin conversion option:Discontinue edoxaban and administer a parenteral anticoagulant and warfarin at the time of the next scheduled edoxaban dose. Once a stable INR = or > 2.0 is achieved the parenteral anticoagulant should be discontinued and the warfarin continued.- When converting from edoxaban to another DOAC, discontinue edoxaban and begin the other oral anticoagulant at the time of the next scheduled dose of edoxaban.- When converting from edoxaban to parenteral anticoagulation, start the parenteral anticoagulant at the time of the next dose of edoxaban.

Warfarin & Fluvastatin

MODERATE

Patients should be monitored for changes in prothrombin time when a HMG Co-A reductase inhibitor is added to or discontinued from warfarin therapy, or if the dosage of the HMG Co-A reductase inhibitor is adjusted.

Warfarin & Fondaparinux

MODERATE

The manufacturer recommends baseline and periodic platelet counts and hematocrits for the entire duration of heparin administration.Monitor patients receiving concurrent therapy for signs of blood loss, including decreased hemoglobin, hematocrit, fecal occult blood, and/or blood pressure and promptly evaluate patients with any symptoms. Discontinue heparin in patients with active pathological bleeding unless the benefits outweigh the potential risk.Partial thromboplastin time (aPTT) or whole-blood clotting time (WBCT) may be monitored to assess coagulation status.Instruct patients to report any signs and symptoms of bleeding, such as unusual bleeding from the gums or nose; unusual bruising; red or black, tarry stools; red, pink or dark brown urine; acute abdominal or joint pain and/or swelling.

Warfarin & Lovastatin

MODERATE

Patients should be monitored for changes in prothrombin time when a HMG Co-A reductase inhibitor is added to or discontinued from warfarin therapy, or if the dosage of the HMG Co-A reductase inhibitor is adjusted.

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DOB:	1/1/1753	**REPORT DATE:**	8/11/2016	**1^ABC CLINICAL LAB**
SEX:	Female			

Warfarin & Prasugrel

MODERATE

Use caution when administering platelet aggregation inhibitors concurrently with anticoagulants. Careful monitoring of appropriate laboratory values for the patient's anticoagulant (e.g. PTT for heparin, anti Xa levels for low-molecular weight heparins, INR for warfarin) as well as signs and symptoms of bleeding is warranted. Consider regular monitoring of hemoglobin and/or platelet levels. Instruct patients to report any signs and symptoms of bleeding, such as bleeding from the eyes, gums or nose; unusual bruising; dark stools; red or dark brown urine; and/or abdominal pain or swelling.

Warfarin & Propafenone

MODERATE

The addition or removal of propafenone from the therapy of a patient maintained on warfarin should be approached with caution. The patient should be carefully monitored for changes in the effects of warfarin. The dosage of warfarin may need to be adjusted.

Warfarin & Propranolol

MODERATE

Prothrombin times should be monitored when propranolol is added to or discontinued from warfarin therapy. Patients should be monitored for clinical signs of bleeding.

Warfarin & Rivaroxaban

SERIOUS

The long-term use of concurrent therapy with Direct Oral Anticoagulants (DOACs) and other anticoagulants is generally considered contraindicated. However, overlap may be necessary when switching therapy from one agent to another in order to prevent thrombotic events. Manufacturer recommendations concerning overlap (if any) and timing of discontinuation versus initiation vary depending upon which agent is being discontinued and initiated. Refer to current prescribing information for both agents for additional details.Monitor patients receiving concurrent therapy for signs of blood loss, including decreased hemoglobin, hematocrit, fecal occult blood, and/or decreased blood pressure and promptly evaluate patients with any symptoms. Discontinue rivaroxaban in patients with active bleeding.Avoid concurrent use of rivaroxaban and anticoagulants other than periods of therapeutic transition between agents or if benefit outweighs increased risk of bleeds.When converting from warfarin to rivaroxaban, discontinue warfarin and begin rivaroxaban once international normalized ratio (INR) is below 3.0.When converting from rivaroxaban to warfarin, rivaroxaban affects INR, therefore concurrent administration with warfarin is not useful in determining target warfarin dose. If continuous anticoagulation is warranted, discontinue rivaroxaban and begin both warfarin and a parenteral anticoagulant when next dose of rivaroxaban is due. Once INR is within range, discontinue the parenteral anticoagulant.When converting from rivaroxaban to anticoagulants other than warfarin and switching to an anticoagulant with rapid onset, discontinue rivaroxaban and begin new anticoagulant when next dose of rivaroxaban is due.When converting to rivaroxaban from anticoagulants other than warfarin, discontinue current anticoagulant and begin rivaroxaban between 0-2 hours before next evening dose of the drug is due. For patients receiving continuous infusion of unfractionated heparin, simultaneously stop the infusion and administer rivaroxaban.

Warfarin & Rosuvastatin

MODERATE

Patients should be monitored for changes in prothrombin time when a HMG Co-A reductase inhibitor is added to or discontinued from warfarin therapy, or if the dosage of the HMG Co-A reductase inhibitor is adjusted.

Warfarin & Simvastatin

MODERATE

Patients should be monitored for changes in prothrombin time when a HMG Co-A reductase inhibitor is added to or discontinued from warfarin therapy, or if the dosage of the HMG Co-A reductase inhibitor is adjusted.

Warfarin & Ticagrelor

MODERATE

Use caution when administering platelet aggregation inhibitors concurrently with anticoagulants. Careful monitoring of appropriate laboratory values for the patient's anticoagulant (e.g. PTT for heparin, anti Xa levels for low-molecular weight heparins, INR for warfarin) as well as signs and symptoms of bleeding is warranted. Consider regular monitoring of hemoglobin and/or platelet levels. Instruct patients to report any signs and symptoms of bleeding, such as bleeding from the eyes, gums or nose; unusual bruising; dark stools; red or dark brown urine; and/or abdominal pain or swelling.

Warfarin & Vorapaxar

MODERATE

Use caution when administering platelet aggregation inhibitors concurrently with anticoagulants. Careful monitoring of appropriate laboratory values for the patient's anticoagulant (e.g. PTT for heparin, anti Xa levels for low-molecular weight heparins, INR for warfarin) as well as signs and symptoms of bleeding is warranted. Consider regular monitoring of hemoglobin and/or platelet levels. Instruct patients to report any signs and symptoms of bleeding, such as bleeding from the eyes, gums or nose; unusual bruising; dark stools; red or dark brown urine; and/or abdominal pain or swelling.

Warfarin & Zocor

MODERATE

Patients should be monitored for changes in prothrombin time when a HMG Co-A reductase inhibitor is added to or discontinued from warfarin therapy, or if the dosage of the HMG Co-A reductase inhibitor is adjusted.

Zocor

Intermediate Myopathy Risk (SLCO1B1: Decreased Function)

ACTIONABLE

Simvastatin plasma concentrations are expected to be elevated. **Consider avoiding simvastatin,** and prescribe an alternative statin or another hypolipidemic drug, or consider prescribing simvastatin at a lower starting dose (20 mg/day). Routine creatine kinase (CK) monitoring is also advised. **The FDA recommends against the 80 mg daily dose.** Although the association between the SLCO1B1 521C>T variant and myopathy risk is not clearly established for other statins such as atorvastatin, pitavastatin, rosuvastatin, and pravastatin, caution is advised if high doses of these statins are used in this patient. Fluvastatin plasma levels are not affected by the SLCO1B1 521C>T variant.

Zocor & Ranolazine

SEVERE

Do not exceed a dosage of 20 mg daily of simvastatin in patients receiving concurrent therapy with ranolazine.

Zocor & Ranolazine

MODERATE

Do not exceed a dosage of 20 mg daily of simvastatin in patients receiving concurrent therapy with ranolazine.Consider a reduction of atorvastatin or lovastatin dose with concurrent ranolazine.

Zocor & Ticagrelor

SERIOUS

Avoid the use of doses of lovastatin and simvastatin greater than 40 mg in patients receiving ticagrelor. Monitor patients receiving concurrent therapy for signs and symptoms of myopathy.

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PATIENT INFORMATION

NAME: JILLIAN DOE
ACC #: 1607190464
DOB: 1/1/1753
SEX: Female

SPECIMEN DETAILS

COLLECTION DATE: 7/19/2016
RECEIVED DATE: 7/19/2016
REPORT DATE: 8/11/2016

ORDERED BY

DOCTOR JONES

1^ABC CLINICAL LAB

Test Details

Gene	Genotype	Phenotype	Alleles Tested
CYP2C9	*1/*1	Normal Metabolizer	*2, *3, *4, *5, *6, *11
CYP2C19	*17/*17	Ultra-Rapid Metabolizer	*2, *3, *4, *4B, *6, *7, *8, *9, *10, *17
CYP2D6	*1/*35	Normal Metabolizer	*2, *3, *4, *4M, *6, *7, *8, *9, *10, *12, *14A, *14B, *17, *29, *35, *41
CYP3A5	*3/*3	Poor Metabolizer	*1D, *2, *3, *3C, *6, *7, *8, *9
CYP3A4	*1/*1	Normal Metabolizer	*1B, *2, *3, *12, *17, *22
VKORC1	-1639G>A G/A	Intermediate Warfarin Sensitivity	-1639G>A
Apolipoprotein E	ε3/ε4	Increased Risk of Hyperlipidemia/Atherosclerotic Vascular Disease	ε2, ε4, (ε3 is reference)
CYP2B6	*1/*1	Normal Metabolizer	*6, *9
SLCO1B1	521T>C TC	Decreased Function	521T>C, 388A>G
COMT	Val158Met AG	Intermediate COMT Activity	Val158Met
ANKK1/DRD2	DRD2:Taq1A AG	Altered DRD2 function	DRD2:Taq1A
OPRM1	A118G AA	Normal OPRM1 Function	A118G
CYP1A2	*1A/*1V	Normal Metabolizer- Possible Inducibility	*1C, *1D, *1F, *1K, *1L, *1V, *1W
MTHFR	1298A>C AA 677C>T CC	No Increased Risk of Hyperhomocysteinemia	1298A>C, 677C>T
Factor II Factor V Leiden	20210G>A GG 1691G>A GG	No Increased Risk of Thrombosis	20210G>A, 1691G>A

Disclaimer: Only a physician, pharmacist or other healthcare professional should advise a patient on the use of information in this report.

Methodology: All single nucleotide polymorphisms tested in duplicate by PCR-reporter probe technology. Copy number variation tested in quadruplicate with PCR-reporter probe technology.

Limitations: This test will not detect all the known mutations that result in altered or inactive tested genes. Absence of a detectable gene mutation or polymorphism does not rule out the possibility that a patient has intermediate or high sensitivity phenotypes due to the presence of an undetected polymorphism or due to drug-drug interactions.

The Drug interaction report is provided via a third party agreement with First Data Bank (FDB). FDB is entirely responsible for the accuracy of the drug interaction data. The report is solely intended to be used by a medical professional. The drug interaction report is based on patient reported medications and does not account for other factors such as smoking history, tobacco use, diet and other underlying chronic conditions like diabetes or heart disease. The treating medical professional bears the ultimate responsibility for all the treatment decisions made in regards to a patient and including any decisions based on the drug interaction report.