Helix Pharmacogenomics (PGx) Cardiovascular Panel

Item	Description
Test Name	Helix Pharmacogenomics (PGx) Cardiovascular Panel
Test Type	Pharmacogenomics
Catalog Number	PCAR1
Procedure Code	H00424-1 (Helix)
Test Description	This panel evaluates 11 genes associated with response to drugs prescribed to treat cardiovascular disease, including anticoagulants, antiarrhythmics, antihypertensives, antiplatelets, beta blockers, and HMG-CoA Reductase Inhibitors (statins). Results from this test may help in predicting treatment efficacy and risk of side effects for these drugs.
Genes Tested	*ABCB1, ABCG2, CYP2C* cluster*, CYP2C9, CYP2C19, CYP2D6, CYP3A4, CYP4F2, GRK4, SLCO1B1, VKORC1*
Genetics Information	This test utilizes next-generation sequencing to determine results for *ABCB1, ABCG2, CYP2C cluster, CYP2C9, CYP2C19, CYP2D6, CYP3A4, CYP4F2, GRK4, SLCO1B1, and VKORC1*. These results are used to determine drug considerations for the following drugs: Atorvastatin, Clopidogrel, Flecainide, Fluvastatin, Lovastatin, Metoprolol, Pitavastatin, Pravastatin, Propafenone, Rosuvastatin, Simvastatin, Warfarin. Additionally, due to lack of sufficient scientific evidence, genetic outcomes are provided without drug considerations for the following drugs: Atenolol, Carvedilol, Digoxin, Losartan, Nebivolol, Propranolol, Quinidine, Timolol.
Indications For Testing	Patients for whom any of the above medications are being considered, have been ineffective or caused side effects.
Clinical Descriptions	Many medications used to treat cardiovascular conditions are impacted by specific variations in known genes. These genetic variations can contribute to medication efficacy and risk for side effects. Pharmacogenomic testing to guide prescribing, paired with clinical monitoring can impact outcomes for patients by reducing the time to therapeutic effect and reducing the risk of side effects.
Disease States	Coronary artery disease, hyperlipidemia, arrhythmias,hypertensions, heart failure and other cardiovascular conditions.
Interpretation	All detected variants are evaluated according to the Clinical Pharmacogenetics Implementation Consortium (CPIC). Variants are classified based on known, predicted, or possible impact on drug metabolism.
Reclassification Of Variants	Helix does not systematically review variants evaluated and reported for this test looking for guideline updates or classification changes. Helix will review the classification of previously reported variants upon request of the ordering physician/provider. Ordering physicians/providers may contact Helix Customer Support to request a review of updates to CPIC guidelines and/or variant classification in terms of impact on drug metabolism. At the discretion of the laboratory director, the frequency of reclassification requests may be limited to once per year, no earlier than 12 months after initial evaluation has been performed.

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Variant Evaluation	Variant classification is performed using data provided by CPIC whenever available. When CPIC data is not available, a thorough literature search is performed to evaluate whether specific alleles have known and established impact on drug metabolism. Recommendations and interpretation for dosage and prescription are based on guidelines set forth by CPIC, the Food and Drug Administration (FDA), and the Pharmacogenomics Knowledgebase (PharmGKB). Variants are classified as having impact on drug metabolism with the following tiers: poor metabolizer, intermediate metabolizer, normal metabolizer, and ultrarapid metabolizer. These classifications are based on the combination of alleles found in the given individual and data set forth by CPIC and the other entities mentioned above. Variants of unknown significance on drug metabolism are not reported.
Turnaround Time	7 to 10 days
Available In NY State	No
Test Classification	This test was developed, and its performance characteristics determined, by Helix, Inc. in a manner consistent with CLIA requirements. This test has not been cleared or approved by the US Food and Drug Administration.
Performing Laboratory Information	CLIA Laboratory Number: 05D2117342 Laboratory Hours of Operation: Monday-Saturday (7AM-10:30PM PST) Address: 10170 Sorrento Valley Road, Suite 100, San Diego, CA 92121 Helix Customer Service: (844) 211-2070 Email: support@helix.com
Regulatory Information	CLIA Complexity: High Test Classification: Non-Waived/ Laboratory Developed Test
CLIA Category	Chemistry / Routine Chemistry

Methods & Limitations for Helix Pharmacogenomics (PGx) Cardiovascular Panel

Data were generated from extracted DNA using the validated Helix Exome+ assay by the Helix clinical laboratory. The Exome+ assay is based on target enrichment followed by next generation sequencing using paired end reads on an Illumina DNA sequencing system. Star alleles were determined using a proprietary algorithm which performs variant calling and then determines star allele solutions based on a combination of defining SNPs and exon-level copy number.

Metabolizer status was determined based on star allele solutions according to CPIC guidelines, with the following exceptions: (1) metabolizer status was set as Indeterminate if a novel nonsense or truncating novel mutation was observed within the gene, (2) metabolizer status was set as Indeterminate if the combination of defining SNPs and copy number suggested a novel star allele solution, and (3) if more than two copies of a gene were detected then metabolizer status was set as Indeterminate. Drug/gene considerations were limited to guidelines published by FDA, CPIC, or PharmGKB.

Phasing could not be performed for genotypes, and therefore in some cases the star allele solution could not be disambiguated between two or more equally likely possibilities. In these cases, if the metabolizer status was the same regardless of possible star allele solutions, the more common star allele solution was provided along with the metabolizer status. If the metabolizer status was different for the equally-likely star allele solutions, the star alleles were reported as Unknown and the metabolizer status was considered Indeterminate.

All samples were sequenced and interpreted in Helix's CLIA-certified (#05D2117342) and CAP-accredited (#9382893) laboratory in San Diego, California. These tests have not been cleared or approved by the U.S. Food and Drug Administration.

The reportable range includes the following results:
ABCB1: rs2032582, rs1128503, rs1045642; ABCG2: rs2231142; CYP2C cluster: rs12777823; CYP2C9: *1-*61; CYP2C19: *1-*19, *22-*26, *28-*39; CYP2D6: *1-*15, *4N, *17-*65, *68-*75, *81, *83-*114; CYP3A4: *1-*24, *26, *28-*38; CYP4F2: *1,*3; GRK4: rs1024323; SLCO1B1: *1-*16, *19, *20, *23-*34, *36-*44, *47-*49; VKORC1: rs9923231. Sensitivity may be reduced for the *CYP2D6**13 allele.

Results are based on:
Atorvastatin, SLCO1B1 (CPIC A); Clopidogrel, CYP2C19 (FDA Section 1); Flecainide, CYP2D6 (PGKB 1A); Fluvastatin, CYP2C9, SLCO1B1 (CPIC A); Lovastatin, SLCO1B1 (CPIC A); Metoprolol, CYP2D6 (PGKB 1A); Pitavastatin, SLCO1B1 (CPIC A); Pravastatin, SLCO1B1 (CPIC A); Propafenone, CYP2D6 (FDA Section 1); Rosuvastatin, ABCG2, SLCO1B1 (CPIC A); Simvastatin, SLCO1B1 (CPIC A); Warfarin, CYP2C cluster (PGKB 1A); Warfarin, CYP2C9, CYP4F2, VKORC1 (FDA Section 1, CPIC A).

Disclaimer:
The interpretations and drug considerations provided by Helix are intended solely for use by a medical professional and do not constitute medical advice by Helix. All treatment decisions and diagnoses remain the full responsibility of the treating provider. Results included in this report are based on the guidelines published by the FDA and CPIC, and do not account for other factors that may impact drug response, such as environment, medical conditions, drug-drug interactions, or additional genetic variants. Helix is not responsible or liable for any errors, omissions, or ambiguities in the interpretation or use of the results of this report. Administration of any medication listed in this report requires careful therapeutic monitoring regardless of the drug considerations outlined in this report. All dates and times displayed are Pacific Time and may vary from the dates and times for Collection, Order and Report for the providers/patients.

Targeted Genes & Methodology for Helix Pharmacogenomics (PGx) Cardiovascular Panel

The following applies to the Helix The following applies to the Helix Pharmacogenomics (PGx) Cardiovascular Panel. Next-generation sequencing is performed to test for the presence of star allele solutions in the genes analyzed, according to the reportable range listed.

This list is current from January 2025 to the present. For questions regarding genes, reference transcripts, or specific regions covered, contact Helix Customer Service at (844) 211-2070.

Catalog Number: PCAR1

Gene	Reportable Range
ABCB1	rs2032582, rs1128503, rs1045642
ABCG2	rs2231142
CYP2C cluster	rs12777823
CYP2C9	*1-*61
CYP2C19	*1-*19, *22-*26, *28-*39
CYP2D6	*1-*15, *4N, *17-*65, *68-*75, *81, *83-*114
CYP3A4	*1-*24, *26, *28-*38
CYP4F2	*1,*3
GRK4	rs1024323
SLCO1B1	*1-*16, *19, *20, *23-*34, *36-*44, *47-*49
VKORC1	rs9923231