Bumrungrad Personalized Medication Review

Mr. Test Data

HN 987654321

Pharmacogenomics Clinic

Bumrungrad International Hospital

Bumrungrad International HOSPITAL

Personalized Medication Review

Name Mr. Test Data HN 987654321 Date of birth 1th June 1950

Collected Date: 6th Apr 2023

Reported Date: 6th May 2023

Personalized Medicine report

Genetic Testing for Drug Metabolism
PGx panel – BH MedGene test **

Current medications

1- **Ebatrexat® (Methotrexate)** is a medicine used in treatment of autoimmune disease, such as rheumatoid arthritis. Though its metabolism may associate with SLCO1B1 drug transporter, there is no strong evidence reporting correlation between the drug toxicity and SLCO1B1 genetic variant. However, you would be carefully monitored by a doctor. Blood tests, such as complete blood count, kidney and liver function may be ordered, and folic acid would be also prescribed to help protect the healthy cells in your body and reduce some side effects of methotrexate, including vomiting and diarrhea.

2- **Thrombo Ass® (acetylsalicylic acid or Aspirin)** is a blood thinner used in the prevention of cardiovascular disease, such as heart attack or stroke. This medicine is partially metabolized by CYP2C9 enzyme. Since you have a normal function of CYP2C9, you may have a good drug response. However, the side effects, such as bleeding should be of concern as a blood thinner, especially concomitant use with other drugs or supplements with blood thinning property; for example, fish oil, garlic extract, ginkgo biloba extract, etc.

3- **Ezeroso® (Rosuvastatin+Ezetimibe)** is a combination of lipid lowering agents.

1) Rosuvastatin is a lipid lowering agent in hydrophilic statin group. It is transported into the liver by SLCO1B1 drug transporter then removed from the body. It is also eliminated by CYP2C9 and CYP3A4 enzyme in a minor pathway. Since you have a decreased function of SLCO1B1, you may have an increased risk of side effects, such as myalgia. You are recommended to avoid use of the drugs mainly metabolized by CYP3A4 enzyme, such as Simvastatin and high dose Atorvastatin. A limited dose of Rosuvastatin (≤ 20 mg/day) may be prescribed along with the side effect monitoring. If higher dose is needed for desired efficacy, doctor may consider a combination therapy (i.e., Rosuvastatin plus non-statin guideline directed medical therapy). Creatine phosphokinase (CK) test may also be ordered if statin induced muscle toxicity is suspected.

2) Ezetimibe is a non-statin lipid lowering agent which its metabolism may associate with SLCO1B1 drug transporter. Though, you have a decreased function of SLCO1B1, the medicine may be less likely to cause muscle toxicity. You may be recommended to use non-statin drug as an alternative in case of statin intolerance.

4- **Concor® (Bisoprolol)** is a medicine used in heart rate control and hypertension. It is eliminated by CYP2D6 and CYP3A4 in a minor pathway. Since you have an intermediate function of CYP3A4 enzyme and a normal function of CYP2D6, you may generally have a good drug response due to higher drug level. However, be aware of the side effects, such as hypotension, fatigue, and slow heart rate.

5- **Urosin® (Tamsulosin hydrochloride)** is a medicine used in treatment of prostate disease. It is eliminated by CYP3A4 and CYP2D6 enzyme in a major pathway. Since you have a normal function of CYP2D6, but an intermediate function of CYP3A4, you may have a good drug response due to higher drug level. However, the side effects, such as orthostatic hypotension, headache and dizziness should be closely monitored.

6- **Finasterid® (Finasteride)** is a medicine used in treatment of prostate disease. It is eliminated by CYP3A4 enzyme in a minor pathway. Since you have an intermediate function of CYP3A4, you may have a good drug response due to higher drug level. However, the side effects, such as orthostatic hypotension and sexual disorder should be monitored.

7- **Pantoloc® (Pantoprazole)** is an antacid used in gastric condition. It is eliminated by CYP2C19, CYP2D6 and CYP3A4 enzyme in a minor pathway. Since you have a normal function of CYP2C19 and CYP2D6, but an intermediate function of CYP3A4, you may have a good response. It would be recommended to initiate standard daily dosing and increase the dose if you have inadequate response. For the treatment of H. pylori infection and the treatment of erosive esophagitis, the doctor may consider increasing the dose by 50-100% from the standard dose.

Past medications

1- **Sortis® (Atorvastatin)** is a lipid lowering agent in the statin group. The medicine is transported into the liver by SLCO1B1 drug transporter then removed from the body. It is also eliminated by CYP3A4 enzyme in a major pathway. Since you have an intermediate function of CYP3A4 and considering together with a decreased function of SLCO1B1, you may be at a high risk of statin side effects, such as myotoxicity due to higher drug level. It would be recommended to avoid use of Simvastatin. If a low dose of Atorvastatin is needed, it should be used with caution along with side effects monitoring. Doctor may prescribe an alternative hydrophilic statin, such as Rosuvastatin and Pravastatin with a limited dose, or may consider a non-statin lipid lowering agent, such as Ezetimibe to lower the risk of side effects.

2- **Jardiance® (Empagliflozin)** is an oral hypoglycemic agent which increases excretion of glucose in urine. Its metabolism may associate with SLCO1B1 drug transporter. Since you have a decreased function of SLCO1B1, you may have a good drug response. As the medicine causes you to lose water, you should drink plenty of water, especially during exercise or in hot weather. It would be also recommended to keep hygienic to prevent the drug's side effect, such as genitourinary infection and be sure to seek medical help promptly if you have severe nausea, vomiting, belly pain, feeling tired, and trouble breathing.

3- **Melatonin** is a supplement which helps control sleep cycle. It is mainly eliminated by CYP1A2 enzyme. Since you have an ultra-rapid function of CYP1A2, the drug elimination may be increased in the presence of inducers, such as tobacco smoke, consumption of regular coffee, cruciferous vegetables or chargrilled meats leading to lower drug level. If you have an inadequate response, it would be recommended to increase the drug dose or consider another option which is not associated with CYP1A2.

Personalized Medication Review

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Drug interaction

The concomitant use of drugs with hypotensive property, such as **Urosin® (Tamsulosin hydrochloride)**, **Concor® (Bisoprolol)**, **Tritazide®(Ramipril and Hydrochlorothiazide) and Tritace® (Ramipril)** is effective to control blood pressure but may enhance hypotension, headache and dizziness. Therefore, the daily blood pressure should be monitored closely, especially when your medications are adjusted. To minimize dizziness and light-headedness due to lowering of your blood pressure, get up slowly when rising from a seat or lying position.

CYP3A4 enzyme is responsible for the metabolism of more than half of the prescription drugs. In addition to the genetic factor, there are others, such as some other drugs, food, or supplements which may alter the response to the drugs metabolized by CYP3A4 enzyme.

CYP3A4 potent inhibitors; for example, clarithromycin, erythromycin, diltiazem, itraconazole, ketoconazole, ritonavir, verapamil, goldenseal and grapefruit could slow the drug clearance leading to higher drug level, on the other hand, CYP3A4 strong inducers; for example, phenobarbital, phenytoin, rifampicin, St. John's Wort and glucocorticoids could decrease exposure of the active drug. **You should bring your lists of all current medications and supplements to the hospital or pharmacy every visit, so that a doctor or pharmacist could check some possible drug interaction or side effects among them.**

Regarding antidiabetic injection; **Ozempic® (Semaglutide) and Saxenda® (Liraglutide)**, anti-rheumatic injection; **Enbrel®(Etanercept)** and oral medications; **Tritazide® (Ramipril and Hydrochlorothiazide), Tritace®(Ramipril), Aerius® (Desloratadine),** supplements; **Dekristolmin® (Cholecalceferol), Folsan® (folic acid)** and other products from VitalLife, the response including the efficacy and side effects of them could not be predicted from the genetic testing for drug metabolism (BH-MedGene)

Note: The prediction is based on simply the genetic profile. Other factors such as patient's current condition, kidney and liver function, and drug interaction among drugs, etc. may also be considered by the doctor if your medication treatment would be adjusted.

Reviewed by R. Ph 1

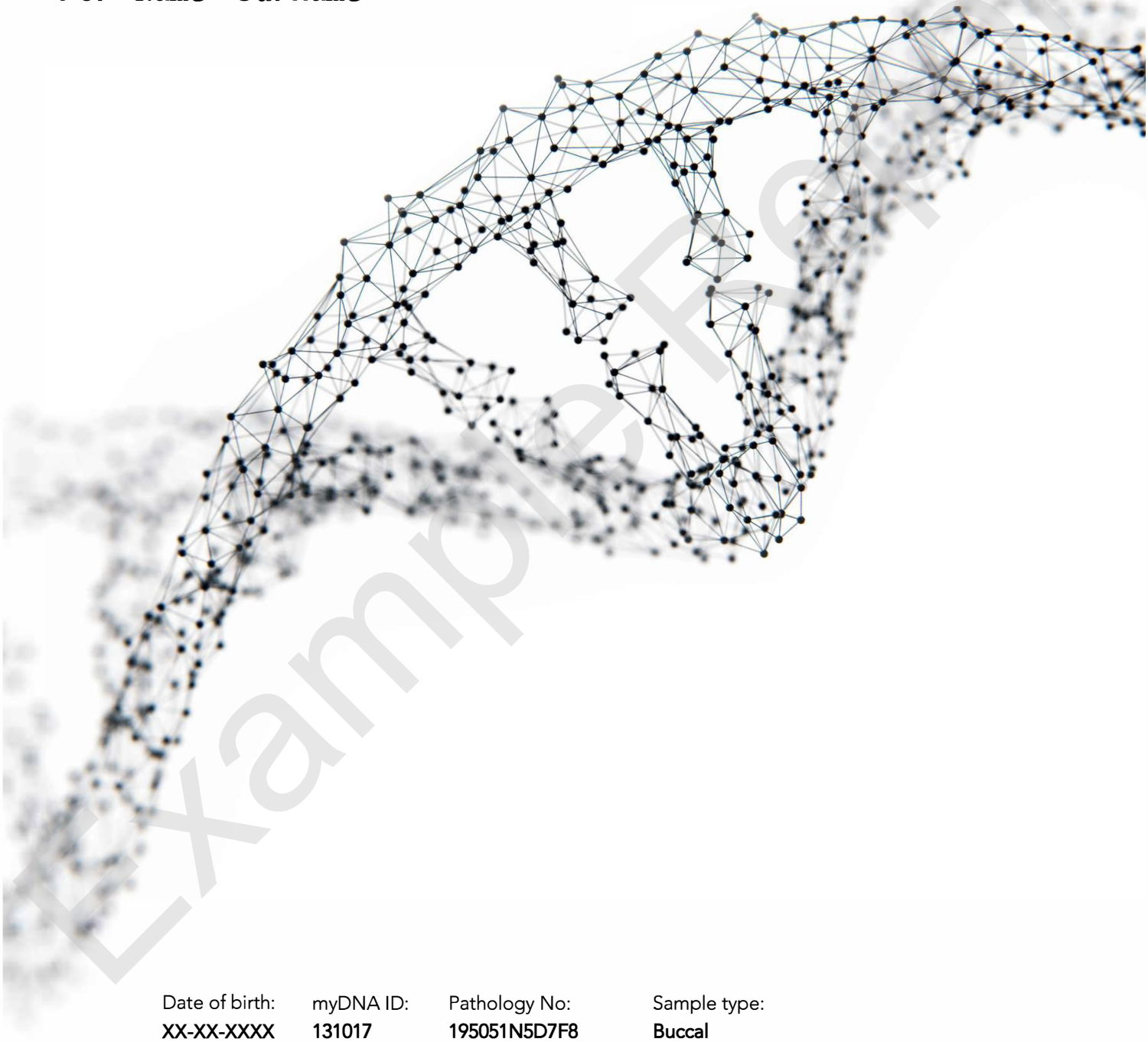
Pharmacy License No. 87654

Approved by: R. Ph 2

Pharmacy License No. 45678

PERSONALISED MEDICATION REPORT

For Name Sur name



Date of birth:	myDNA ID:	Pathology No:	Sample type:
XX-XX-XXXX	131017	195051N5D7F8	Buccal
Collected:	Received:	Reported:	Doctor:
9-May-2024	23-May-2024	2-Jul-2024	Dr Nipat Kulabkaw

ABOUT THIS REPORT

Overview

This report provides clinically relevant information on what the patient's genetic results predict about their response to a number of medications covered by this report.

The information concerns drug metabolism and plasma concentrations (drug exposure), as well as the potential for altered clinical effects.

Based on the available information found in the published literature, each medication has been assigned a category according to the likely clinical significance of each gene-drug interaction.

The three categories are:

- Major prescribing considerations – A significant effect to drug response is predicted. There may be guidelines recommending consideration be given to a change in the dose or the medication type, in order to minimise the risk of the potential clinical issue noted.
- Minor prescribing considerations – Altered drug response is possible, but the clinical significance is either thought to be minor or there is insufficient data available. Consider monitoring for the clinical issue noted in this report and any guideline prescribing recommendations.
- Usual prescribing considerations – Genetic results are not predicted to affect drug response, and there are no additional prescribing considerations. Other factors may still influence drug response and therefore usual monitoring for adverse effects and efficacy still applies.

For many medications covered in this report, international, peer reviewed prescribing guidelines are available and these are included in our report.

The two major guidelines are those of the Clinical Pharmacogenetics Implementation Consortium (CPIC) and the Royal Dutch Pharmacists Association – Pharmacogenetics Working Group (DPWG).

Report breakdown

The report consists of the following sections:

- Report Summary – identifies which of the patient's listed medications have pharmacogenomic information relevant to the genes tested, with an indication of the clinical importance of this information (i.e. "Major", "Minor" or "Usual" prescribing considerations).
- Genetic Test Results Overview – genotype result for the eight gene test (i.e. six genes encoding CYP450 metabolising enzymes relevant to a large number of medications, *VKORC1* which relates to warfarin sensitivity and *SLCO1B1* which relates to statin induced myopathy).
- Medications of Interest – details of the interaction between the patient's genetic results and their medication, based on the current scientific literature, as well as clinical recommendations, many sourced from peer-reviewed, published guidelines.
- Potential Drug Interactions – identifies which of the patient's listed medications can significantly inhibit or induce CYP enzymes, as they may modify the genotype-predicted enzyme function.
- Future Medications – lists medications that the patient is not currently taking that have potentially clinically significant prescribing considerations based on the patient's genetic test results (also classified as having "Major", "Minor" or "Usual" prescribing considerations).

As part of our clinical service, we have a team of clinical experts available to answer any questions you may have about this report or about pharmacogenomics in general.

If you have any such queries,
please contact our team by emailing
Pharmacogenomics@bumrungrad.com.

Personalised Medication Report

for *Chai Sakdejayont*

Unless instructed by their doctor, patients are advised not to alter the dose or stop any medications.

Name:	Name Surname	DOB:	XX-XX-XXXX	Collected:	9-May-2024
Address:	N/A	myDNA ID:	131017 195051	Received:	23-May-2024
		Pathology No:	N5D7F8	Reported:	2-Jul-2024
Doctor:	Dr Nipat Kulabkaw	Copy to:			
Sample type and quality:	Buccal. The sample quality was assessed and deemed to be satisfactory according to the laboratory's acceptance criteria.				
Clinical Notes:					

REPORT SUMMARY

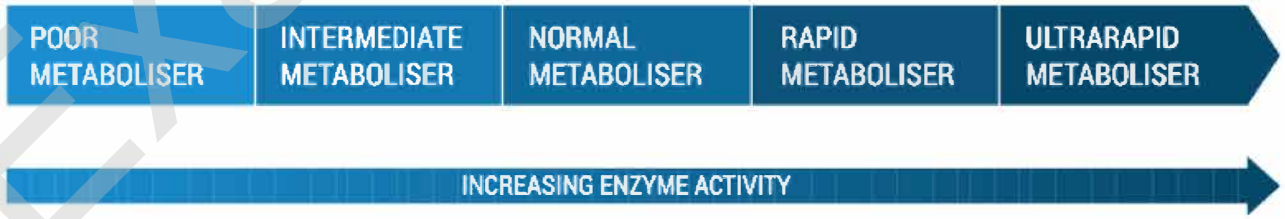
MEDICATIONS OF INTEREST OVERVIEW
MEDICATIONS THAT DO NOT HAVE PRESCRIBING CONSIDERATIONS BASED ON myDNA TEST
erlotinib, memantine, dexamethasone

GENETIC TEST RESULTS OVERVIEW

GENE	GENOTYPE	PREDICTED PHENOTYPE	GENE	GENOTYPE	PREDICTED PHENOTYPE
CYP2D6	*36+*10/*1	Normal metaboliser	*CYP3A5*	*1/*3	Intermediate metaboliser
CYP2C19	*2/*2	Poor metaboliser	*SLCO1B1*	*1/*1	Normal transporter function
CYP2C9	*1/*1	Normal metaboliser	*OPRM1*	AG	Reduced mu opioid receptor expression
VKORC1	AA	Significantly reduced VKORC1 enzyme level	*CYP2B6*	*1/*1	Normal metaboliser
CYP1A2	*1A/*1F	Normal metaboliser	*ABCG2 (rs2231142)*	AC	Decreased transporter function
CYP3A4	*1/*1	Normal metaboliser			

Detailed interpretations of genetic test results are provided in the *pharmacogenomic interpretation* section below.

The following diagram provides the range of enzyme activity predicted by the myDNA test.



POTENTIAL DRUG INTERACTIONS

The effect of drug-drug interactions can be additive to the effect of genotype on drug metabolism. Inhibitors can decrease and inducers can increase metabolism, leading to changes in drug concentration and clinical effects.

Comments in the medications of interest and future medications sections only consider the effects of the patient's genotype, not those due to interacting drugs. For the health professional's consideration, the table below identifies which of the patient's current drugs may inhibit or induce those enzymes tested by myDNA. The extent of the inhibition or induction depends on the dose and duration of the therapy. The overall effect on metabolism by a specific enzyme may be estimated by considering both the genetic finding and the potential interacting drug.

MEDICATION	INHIBITOR – MODERATE	INHIBITOR - STRONG	INDUCER
Dexamethasone			CYP3A

FUTURE MEDICATIONS

The following tables outline personalised recommendations for future medications.

NOTE: These tables do not account for the effect of any inhibitors or inducers. The table is not an all-inclusive list of medications but includes many commonly prescribed medications.

MEDICATIONS WITH *MAJOR* PRESCRIBING CONSIDERATIONS

MEDICATION (DRUG CATEGORY)	INTERPRETATION	RECOMMENDATION
Acenocoumarol (Anticoagulants)	***VKORC1* - Significantly reduced VKORC1 enzyme level** ***CYP2C9* - Normal metaboliser:** Normal metabolism of acenocoumarol by CYP2C9 is predicted. Significantly reduced amount of VKORC1 present (the enzyme inhibited by acenocoumarol). Overall increased sensitivity to acenocoumarol, an increased risk of both supratherapeutic INR and bleeding, and a lower dose requirement are predicted.	For patients commencing acenocoumarol, based on the VKORC1 genotype, DPWG[1] recommends using of 50% of the standard initial dose and more frequent monitoring of the INR. For patients already taking acenocoumarol, dose adjustment should be guided by INR.
Warfarin (Anticoagulants)	***VKORC1* - Significantly reduced VKORC1 enzyme level** ***CYP2C9* - Normal metaboliser:** Normal metabolism of warfarin by CYP2C9 is predicted. Significantly reduced amount of VKORC1 (the enzyme warfarin inhibits). The combined CYP2C9 and VKORC1 results predict increased warfarin sensitivity and increased risk of supratherapeutic INR.	CYP2C9 and VKORC1 - For patients already taking warfarin (e.g. more than 5 doses), dose adjustment is guided by INR. For patients initiating warfarin, there are CPIC[2] recommendations to reach the therapeutic dose. The summary of CPIC recommendations include consideration of the use of validated published pharmacogenetic algorithms[3],[4] available at warfarindosing.org that take into account clinical details as well as genetic findings. See CPIC guidelines for further details. If the patient identifies to be of African ancestry, CPIC provides recommendations for special dosing requirements for warfarin.
Citalopram (Antidepressants - SSRIs)	***CYP2C19* - Poor metaboliser:** Negligible metabolism of citalopram by CYP2C19 and greatly	CPIC guidelines[6] provide a strong recommendation to consider an alternative antidepressant not predominantly metabolised

MEDICATIONS WITH *MAJOR* PRESCRIBING CONSIDERATIONS		
MEDICATION (DRUG CATEGORY)	INTERPRETATION	RECOMMENDATION
	increased drug exposure are predicted. This may increase the risk of adverse effects, including QT prolongation.[5]	by CYP2C19. If citalopram is clinically appropriate, consider a lower starting dose, slower titration schedule and a 50% dose reduction of the standard maintenance dose. The TGA approved product information[7] recommends a starting dose of 10mg/day. The TGA approved product information and FDA-approved drug label recommend a maximum dose of 20mg/day, due to the risk of QT prolongation.[7,5] DPWG guidelines similarly recommend not exceeding 50% of the standard maximum dose, i.e. 20mg as tablets or 16mg as drops for adults up to 65 years and 10mg as tablets or 8mg as drops for adults 65 years and over.[8]
Escitalopram (Antidepressants - SSRIs)	***CYP2C19* - Poor metaboliser:** Negligible metabolism of escitalopram by CYP2C19 and greatly increased drug exposure are predicted. This may increase the risk of adverse effects.	CPIC guidelines[6] provide a strong recommendation to consider an alternative antidepressant not predominantly metabolised by CYP2C19. If escitalopram is clinically appropriate, consider a lower starting dose, slower titration schedule and a 50% dose reduction of the standard maintenance dose. The TGA approved product information[9] also recommends an initial dose of 5mg/day (i.e. 50% of the recommended starting dose) and not increasing the dose above 10mg/day. DPWG guidelines are similar and advise not exceeding 50% of the standard maximum doses, being 10 mg/day for adults up to 65 years of age and 5 mg/day for adults 65 years and over.[8]
Sertraline (Antidepressants - SSRIs)	***CYP2B6* - Normal metaboliser** ***CYP2C19* - Poor metaboliser:** Sertraline is metabolised by both CYP2C19 and CYP2B6 into less active compounds. Greatly reduced metabolism by CYP2C19 and normal metabolism by CYP2B6 is predicted.[6]	CPIC[6] guidelines provide a moderate recommendation to consider a lower starting dose, slower titration schedule and a 50% reduction of the standard maintenance dose. Otherwise, switch to an appropriate alternative not predominantly metabolised by CYP2C19.
Amitriptyline (Antidepressants - TCAs)	***CYP2D6* - Normal metaboliser** ***CYP2C19* - Poor metaboliser:** Amitriptyline is metabolised by CYP2C19 into an active metabolite, which is further metabolised by CYP2D6 into an inactive metabolite. Negligible metabolism of amitriptyline by CYP2C19 and normal metabolism of its active metabolite by CYP2D6 are predicted.	For use at higher doses such as in the treatment of depression, CPIC [10] provides a moderate recommendation to avoid amitriptyline use. If amitriptyline is required, a 50% reduction of the recommended steady-state starting dose and utilisation of therapeutic drug monitoring are advised. For use at lower doses such as in treatment of neuropathic pain, initial dose adjustments are not recommended but close monitoring for adverse effects is advisable.
Clomipramine (Antidepressants - TCAs)	***CYP2D6* - Normal metaboliser** ***CYP2C19* - Poor metaboliser:** Clomipramine is metabolised by CYP2C19 into an active metabolite, which is further metabolised by	CPIC guidelines[10] provides an optional recommendation to avoid clomipramine use. If clomipramine is required, a 50% reduction of the recommended stead-state starting dose and utilisation of therapeutic drug monitoring

MEDICATIONS WITH *MAJOR* PRESCRIBING CONSIDERATIONS		
MEDICATION (DRUG CATEGORY)	INTERPRETATION	RECOMMENDATION
	CYP2D6 into an inactive metabolite. Negligible metabolism of clomipramine by CYP2C19 and normal metabolism of its active metabolite by CYP2D6 are predicted.	are advised. Note that these recommendations only apply to higher initial doses of tricyclic antidepressants for treatment of conditions such as depression.
Dosulepin (Antidepressants - TCAs)	***CYP2D6* - Normal metaboliser** ***CYP2C19* - Poor metaboliser:** Dosulepin is metabolised by CYP2C19 into an active metabolite, which is further metabolised by CYP2D6 into an inactive metabolite. Negligible metabolism of Dosulepin by CYP2C19 and normal metabolism of its active metabolite by CYP2D6 are predicted.	CPIC guidelines[10] provides an optional recommendation to avoid dosulepin use. If dosulepin is required, a 50% reduction of the recommended steady-state starting dose and utilisation of therapeutic drug monitoring are advised. Note that these recommendations only apply to higher initial doses of tricyclic antidepressants for treatment of conditions such as depression.
Doxepin (Antidepressants - TCAs)	***CYP2D6* - Normal metaboliser** ***CYP2C19* - Poor metaboliser:** Doxepin is metabolised by CYP2C19 into an active metabolite, which is further metabolised by CYP2D6 into an inactive metabolite. Negligible metabolism of doxepin by CYP2C19 and normal metabolism of its active metabolite by CYP2D6 are predicted.	CPIC guidelines[10] provides an optional recommendation to avoid doxepin use. If doxepin is required, a 50% reduction of the recommended steady-state starting dose and utilisation of therapeutic drug monitoring are advised. Note that these recommendations only apply to higher initial doses of tricyclic antidepressants for treatment of conditions such as depression.
Imipramine (Antidepressants - TCAs)	***CYP2D6* - Normal metaboliser** ***CYP2C19* - Poor metaboliser:** Imipramine is metabolised by CYP2C19 into an active metabolite, which is further metabolised by CYP2D6 into an inactive metabolite. Negligible metabolism of imipramine by CYP2C19 and normal metabolism of its active metabolite by CYP2D6 are predicted. This may increase the risk of adverse effects.	CPIC guidelines[10] provides an optional recommendation to avoid imipramine use. If imipramine is required, a 50% reduction of the recommended steady-state starting dose and utilisation of therapeutic drug monitoring are advised. Note that these recommendations only apply to higher initial doses of tricyclic antidepressants for treatment of conditions such as depression.
Trimipramine (Antidepressants - TCAs)	***CYP2D6* - Normal metaboliser** ***CYP2C19* - Poor metaboliser:** Trimipramine is metabolised by CYP2C19 into an active metabolite, which is further metabolised by CYP2D6 into an inactive metabolite. Negligible metabolism of trimipramine by CYP2C19 and normal metabolism of its active metabolite by CYP2D6 are predicted.	CPIC[10] provides an optional recommendation to avoid trimipramine use. If trimipramine is required, a 50% reduction of the recommended steady-state starting dose and utilisation of therapeutic drug monitoring are advised. Note that these recommendations only apply to higher initial doses of tricyclic antidepressants for treatment of conditions such as depression.
Brivaracetam (Antiepileptics)	***CYP2C19* - Poor metaboliser:** Negligible metabolism by CYP2C19 and increased brivaracetam exposure are predicted. The FDA-approved drug label for	No genotype-guided dosing recommendation available. The FDA-approved drug label for brivaracetam states that CYP2C19 poor metabolisers may require dose reduction.[11] Monitor for adverse effects.

MEDICATIONS WITH *MAJOR* PRESCRIBING CONSIDERATIONS		
MEDICATION (DRUG CATEGORY)	INTERPRETATION	RECOMMENDATION
	brivaracetam note that poor metabolisers may have increased levels of brivaracetam.[11] The clinical significance of this is not known, although there may be an increased risk of adverse effects.	
Voriconazole (Antifungals - Azoles)	***CYP2C19* - Poor metaboliser:** Greatly reduced voriconazole metabolism and higher drug concentrations are predicted. This has been associated in some studies with both improved treatment outcomes and an increased risk of concentration-dependent adverse effects.	CPIC guidelines[12] provide a moderate recommendation to choose an alternative agent that is not dependent on CYP2C19 metabolism as primary therapy in lieu of voriconazole. Such agents include isavuconazole, liposomal amphotericin B and posaconazole, as clinically appropriate. For a patient for whom an alternative to voriconazole is not appropriate, CPIC recommend using a lower than standard voriconazole dose, together with careful therapeutic drug monitoring. DPWG guidelines[13] recommend using 50% of the standard dose and monitoring the plasma concentrations.
Clopidogrel (Antiplatelet drugs)	***CYP2C19* - Poor metaboliser:** Reduced formation of clopidogrel's active metabolite and a reduced antiplatelet effect are predicted. This genotype has been associated with an increased risk of cardiac and cerebrovascular events.[14]	For management of acute coronary syndrome (ACS) with percutaneous coronary intervention (PCI), CPIC guidelines[14] provide a strong recommendation to avoid the use of standard dose (75 mg) clopidogrel if possible, and to use prasugrel or ticagrelor at standard dose if there is no contraindication. For management of non-ACS, non-PCI cardiovascular indications, CPIC guidelines[14] provide a moderate recommendation to avoid the use of standard dose (75 mg) clopidogrel if possible, and to use prasugrel or ticagrelor at standard dose if there is no contraindication. For management of neurovascular indications, CPIC guidelines[14] provide a moderate recommendation to consider an alternative P2Y12 inhibitor at standard dose if clinically indicated and if there is no contraindication. Alternative P2Y12 inhibitors not impacted by CYP2C19 genetic variants include ticagrelor and ticlopidine. Prasugrel is contraindicated in patients with a history of TIA or stroke.
Clobazam (Benzodiazepines)	***CYP2C19* - Poor metaboliser:** Clobazam is metabolised by CYP3A4 into an active metabolite, N-desmethylclobazam, which is responsible for most of the therapeutic effect. N-desmethylclobazam is further metabolised by CYP2C19 into an inactive metabolite. Reduced metabolism of clobazam's active metabolite and an increase in	Based on the CYP2C19 genotype, FDA[15] approved labelling recommends a starting dose of 5mg/day and slow up-titration.

MEDICATIONS WITH *MAJOR* PRESCRIBING CONSIDERATIONS		
MEDICATION (DRUG CATEGORY)	INTERPRETATION	RECOMMENDATION
	clinical effects is predicted. (Note that the effect of variations in CYP3A4 has not been described).	
Diazepam (Benzodiazepines)	***CYP2C19* - Poor metaboliser:** Diazepam is metabolised by CYP3A4 and CYP2C19 into active metabolites, including desmethyldiazepam, which has a long half-life. The CYP2C19 genotype predicts significantly reduced metabolism of both diazepam and desmethyldiazepam, increased plasma concentrations and increased clinical effects (including prolonged sedation). The FDA-approved drug label states that the inter-individual variation in drug clearance is likely attributable to the genetic polymorphisms of CYP2C19 and CYP3A4.[16] (Note that the effect of variations in the CYP3A4 gene on diazepam metabolism have not been described).	If excessive clinical effects (e.g. sedation) are problematic, consider reducing the dose or prescribing an alternative benzodiazepine not extensively metabolised by CYP2C19, such as oxazepam or lorazepam.
Tacrolimus (Calcineurin inhibitors)	***CYP3A5* - Intermediate metaboliser:** Intermediate metabolism of tacrolimus is predicted. Lower dose-adjusted plasma concentrations of tacrolimus are also predicted when usual prescribing procedures are followed (note that the majority of Caucasians are poor metabolisers of tacrolimus who tend to have higher drug concentrations and prescribing procedures were developed for them). This is associated with a reduction in time that the tacrolimus concentration is in the therapeutic range and potentially with increased risk for transplant rejection.	For use in transplant recipients, other than in liver transplant where donor and recipient livers are of different genotypes, CPIC guidelines[17] recommend using an increased starting dose 1.5-2 times the recommended starting dose. Starting oral dose should not exceed 0.3mg/kg/day. Therapeutic drug monitoring should guide ongoing dose adjustments. DPWG guideline[18] recommendations are to use 1.5 times the initial dose and adjust based on therapeutic drug monitoring. In liver transplants where the transplanted liver has a different genotype from the recipient's genotype, there is insufficient evidence to support a dose recommendation.[17], [18]
Allopurinol (Drugs for gout)	***ABCG2 (rs2231142)* - Decreased transporter function:** This genotype is associated with a reduced excretion of uric acid by the kidneys and intestine, meaning that a stronger inhibition of the uric acid production by allopurinol is required to achieve the desired uric acid concentration. The effectiveness of allopurinol is reduced, so that a higher dose is required.	The DPWG guideline[19] recommends using 1.25 times the standard dose. This equates to a dose titration schedule of 100, 200, 400 and 500 mg/day instead of the usual schedule of 100, 200, 300 and 400 mg/day.
Abrocitinib	***CYP2C19* - Poor metaboliser:** Negligible metabolism by CYP2C19	For patients known or suspected to be CYP2C19 poor metabolisers, the FDA-

MEDICATIONS WITH *MAJOR* PRESCRIBING CONSIDERATIONS		
MEDICATION (DRUG CATEGORY)	INTERPRETATION	RECOMMENDATION
(Immunomodulators and antineoplastics)	and increased drug exposure are predicted. The CYP2C19 poor metabolisers have higher systemic drug concentrations and thus may be at higher risk of adverse events.[20], [21]	approved drug label recommends a dosage of 50 mg once daily, to consider increasing the dosage to 100 mg once daily if adequate response is not achieved after 12 weeks and to discontinue therapy if inadequate response is seen after dosage increase to 100 mg daily.[20]
Carisoprodol (Neurological drugs)	***CYP2C19* - Poor metaboliser:** Negligible metabolism by CYP2C19 and increased carisoprodol exposure are predicted. The FDA-approved drug label notes the significant increase in carisoprodol levels and reduced exposure to meprobamate (the active metabolite) compared to normal metabolisers. [22] The clinical significance of this is uncertain, although there may be an increased risk of adverse effects.	No genotype-guided dosing recommendation available. The FDA-approved drug label advises caution in poor metabolisers. Monitor for adverse effects. [22]

MEDICATIONS WITH *MINOR* PRESCRIBING CONSIDERATIONS				
DRUG CATEGORY	MEDICATION	GENE(S) INVOLVED	POTENTIAL CLINICAL ISSUES	PUBLISHED GUIDELINES
ADHD - miscellaneous agents	Atomoxetine	*CYP2D6*	Reduced / inadequate response	*CPIC*[23], *FDA*[24]
Antidepressants - other	Agomelatine	*CYP1A2*	Reduced / inadequate response	-
	Moclobemide	*CYP2C19*	Adverse effects	*DPWG*[25]
Antidiabetics	Gliclazide	*CYP2C9* *CYP2C19*	Increased therapeutic and/or adverse effects	-
Antineoplastics	Cyclophosphamide	*CYP2C19*	Reduced / inadequate response	-
Antivirals	Atazanavir	*CYP3A5*	Reduced / inadequate response	-
Immunomodulators and antineoplastics	Belzutifan	*CYP2C19*	Adverse effects	*FDA*[26]
Miscellaneous	Flibanserin	*CYP2C19*	Adverse effects	*FDA*[27]
	Proguanil	*CYP2C19*	Reduced / inadequate response	-
Proton pump inhibitors	Dexlansoprazole	*CYP2C19*	Increased therapeutic and/or adverse effects	*CPIC*[28], *FDA*[29]
	Lansoprazole	*CYP2C19*	Increased therapeutic and/or adverse effects	*CPIC*[28]
	Omeprazole	*CYP2C19*	Increased therapeutic and/or adverse effects	*CPIC*[28]
	Pantoprazole	*CYP2C19*	Increased therapeutic and/or adverse effects	*CPIC*[28], *FDA*[30]
	Rabeprazole	*CYP2C19*	Increased therapeutic and/or adverse effects	*DPWG*[31]

MEDICATIONS WITH *USUAL* PRESCRIBING CONSIDERATIONS				
DRUG CATEGORY	MEDICATION	GENE(S) INVOLVED	POTENTIAL CLINICAL ISSUES	PUBLISHED GUIDELINES
ADHD - miscellaneous agents	Viloxazine	*CYP2D6*	No altered effect predicted by genotype	-

MEDICATIONS WITH *USUAL* PRESCRIBING CONSIDERATIONS				
DRUG CATEGORY	MEDICATION	GENE(S) INVOLVED	POTENTIAL CLINICAL ISSUES	PUBLISHED GUIDELINES
Angiotensin receptor blockers	Irbesartan	*CYP2C9*	No altered effect predicted by genotype	-
	Losartan	*CYP2C9*	No altered effect predicted by genotype	-
Antianginals	Perhexiline	*CYP2D6*	No altered effect predicted by genotype	-
Antiarrhythmics	Flecainide	*CYP2D6*	No altered effect predicted by genotype	-
	Propafenone	*CYP2D6*	No altered effect predicted by genotype	-
Anticholinergics (genitourinary)	Darifenacin	*CYP2D6*	No altered effect predicted by genotype	-
	Fesoterodine	*CYP2D6*	No altered effect predicted by genotype	-
	Tolterodine	*CYP2D6*	No altered effect predicted by genotype	-
Anticholinesterases	Donepezil	*CYP2D6*	No altered effect predicted by genotype	-
	Galantamine	*CYP2D6*	No altered effect predicted by genotype	-
Anticoagulants	Prasugrel	*CYP2C19*	No altered effect predicted by genotype	*DPWG*[32]
	Ticagrelor	*CYP2C19*	No altered effect predicted by genotype	*DPWG*[33]
Antidepressants - other	Bupropion	*CYP2B6*	No altered effect predicted by genotype	-
	Mianserin	*CYP2D6*	No altered effect predicted by genotype	-
	Mirtazapine	*CYP2D6* *CYP1A2*	No altered effect predicted by genotype	-
	Vortioxetine	*CYP2D6*	No altered effect predicted by genotype	*CPIC*[6]
Antidepressants - SNRIs	Duloxetine	*CYP2D6* *CYP1A2*	No altered effect predicted by genotype	*CPIC*[6]
	Venlafaxine	*CYP2D6*	No altered effect predicted by genotype	*CPIC*[6]
Antidepressants - SSRIs	Fluoxetine	*CYP2D6* *CYP2C9*	No altered effect predicted by genotype	*CPIC*[6]
	Fluvoxamine	*CYP2D6* *CYP1A2*	No altered effect predicted by genotype	*CPIC*[6]
	Paroxetine	*CYP2D6*	No altered effect predicted by genotype	*CPIC*[6]
Antidepressants - TCAs	Amoxapine	*CYP2D6*	No altered effect predicted by genotype	-
	Desipramine	*CYP2D6*	No altered effect predicted by genotype	*CPIC*[10]
	Nortriptyline	*CYP2D6*	No altered effect predicted by genotype	*CPIC*[10]
	Protriptyline	*CYP2D6*	No altered effect predicted by genotype	-
Antidiabetics	Glimepiride	*CYP2C9*	No altered effect predicted by genotype	-
	Glipizide	*CYP2C9*	No altered effect predicted by genotype	-

MEDICATIONS WITH *USUAL* PRESCRIBING CONSIDERATIONS				
DRUG CATEGORY	MEDICATION	GENE(S) INVOLVED	POTENTIAL CLINICAL ISSUES	PUBLISHED GUIDELINES
	Glyburide	*CYP2C9*	No altered effect predicted by genotype	-
	Nateglinide	*CYP2C9*	No altered effect predicted by genotype	-
	Tolbutamide	*CYP2C9*	No altered effect predicted by genotype	*DPWG*[34]
Antiemetics	Metoclopramide	*CYP2D6*	No altered effect predicted by genotype	-
	Ondansetron	*CYP2D6*	No altered effect predicted by genotype	*CPIC*[35]
	Tropisetron	*CYP2D6*	No altered effect predicted by genotype	*CPIC*[35]
Antiepileptics	Fosphenytoin	*CYP2C9*	No altered effect predicted by genotype	*CPIC*[36]
	Lacosamide	*CYP2C19*	Adverse effects	*FDA*[37]
	Phenytoin	*CYP2C9*	No altered effect predicted by genotype	*CPIC*[36]
Antihistamines	Chlorpheniramine	*CYP2D6*	No altered effect predicted by genotype	-
	Dexchlorpheniramine	*CYP2D6*	No altered effect predicted by genotype	-
	Promethazine	*CYP2D6*	No altered effect predicted by genotype	-
Antipsychotics	Aripiprazole	*CYP2D6*	No altered effect predicted by genotype	-
	Aripiprazole Lauroxil	*CYP2D6*	No altered effect predicted by genotype	*FDA*[38 39]
	Brexpiprazole	*CYP2D6*	No altered effect predicted by genotype	-
	Chlorpromazine	*CYP2D6*	No altered effect predicted by genotype	-
	Clozapine	*CYP2D6* *CYP1A2*	No altered effect predicted by genotype	*DPWG*[40]
	Flupenthixol	*CYP2D6*	No altered effect predicted by genotype	*DPWG*[41]
	Haloperidol	*CYP2D6*	No altered effect predicted by genotype	-
	Iloperidone	*CYP2D6*	No altered effect predicted by genotype	-
	Olanzapine	*CYP1A2*	No altered effect predicted by genotype	*DPWG*[40]
	Perphenazine	*CYP2D6*	No altered effect predicted by genotype	-
	Pimozide	*CYP2D6*	No altered effect predicted by genotype	-
	Quetiapine	*CYP3A4*	No altered effect predicted by genotype	*DPWG*[40]
	Risperidone	*CYP2D6*	No altered effect predicted by genotype	-
	Thioridazine	*CYP2D6*	No altered effect predicted by genotype	*FDA*[42]
	Zuclopenthixol	*CYP2D6*	No altered effect predicted by genotype	-
Antitussives	Dextromethorphan	*CYP2D6*	No altered effect predicted by genotype	-

MEDICATIONS WITH *USUAL* PRESCRIBING CONSIDERATIONS				
DRUG CATEGORY	MEDICATION	GENE(S) INVOLVED	POTENTIAL CLINICAL ISSUES	PUBLISHED GUIDELINES
Antivirals	Efavirenz	*CYP2B6*	No altered effect predicted by genotype	*CPIC*[43]
	Nevirapine	*CYP2B6*	No altered effect predicted by genotype	-
Beta blockers	Carvedilol	*CYP2D6*	No altered effect predicted by genotype	-
	Metoprolol	*CYP2D6*	No altered effect predicted by genotype	-
	Nebivolol	*CYP2D6*	No altered effect predicted by genotype	-
	Propranolol	*CYP2D6* *CYP1A2*	No altered effect predicted by genotype	-
	Timolol	*CYP2D6*	No altered effect predicted by genotype	-
Drugs for alcohol dependence	Naltrexone	*OPRM1*	Limited association with increased response	*CPIC*[44]
Drugs for anxiety and sleep disorders	Pitolisant	*CYP2D6*	No altered effect predicted by genotype	-
Drugs for sexual dysfunction	Dapoxetine	*CYP2D6*	No altered effect predicted by genotype	-
Endocrine drugs	Elagolix	*SLCO1B1*	No altered effect predicted by genotype	-
Haemostatic agents	Avatrombopag	*CYP2C9*	No altered effect predicted by genotype	*FDA*[45], *TGA*[46]
Hypnotics	Melatonin	*CYP1A2*	No altered effect predicted by genotype	-
Immunomodulators and antineoplastics	Erdafitinib	*CYP2C9*	No altered effect predicted by genotype	-
	Gefitinib	*CYP2D6*	No altered effect predicted by genotype	-
	Tamoxifen	*CYP2D6*	No altered effect predicted by genotype	*CPIC*[47]
Miscellaneous	Cevimeline	*CYP2D6*	No altered effect predicted by genotype	-
	Dronabinol	*CYP2C9*	No altered effect predicted by genotype	-
	Eliglustat	*CYP2D6*	No altered effect predicted by genotype	*DPWG*[48], *FDA*[49], *TGA*[50]
	Lesinurad	*CYP2C9*	No altered effect predicted by genotype	-
	Lofexidine	*CYP2D6*	No altered effect predicted by genotype	-
	Meclizine	*CYP2D6*	No altered effect predicted by genotype	-
	Mirabegron	*CYP2D6*	No altered effect predicted by genotype	-
	Tamsulosin	*CYP2D6*	No altered effect predicted by genotype	-
Neurological drugs	Deutetrabenazine	*CYP2D6*	No altered effect predicted by genotype	-
	Siponimod	*CYP2C9*	No altered effect predicted by genotype	*FDA*[51]
	Tetrabenazine	*CYP2D6*	No altered effect predicted by genotype	*FDA*[52]

MEDICATIONS WITH *USUAL* PRESCRIBING CONSIDERATIONS				
DRUG CATEGORY	MEDICATION	GENE(S) INVOLVED	POTENTIAL CLINICAL ISSUES	PUBLISHED GUIDELINES
	Valbenazine	*CYP2D6*	No altered effect predicted by genotype	-
NSAIDs	Celecoxib	*CYP2C9*	No altered effect predicted by genotype	*CPIC*[53]
	Diclofenac	*CYP2C9*	No altered effect predicted by genotype	*CPIC*[53]
	Flurbiprofen	*CYP2C9*	No altered effect predicted by genotype	*CPIC*[53]
	Ibuprofen	*CYP2C9*	No altered effect predicted by genotype	*CPIC*[53]
	Indomethacin	*CYP2C9*	No altered effect predicted by genotype	*CPIC*[53]
	Lornoxicam	*CYP2C9*	No altered effect predicted by genotype	*CPIC*[53]
	Mefenamic Acid	*CYP2C9*	No altered effect predicted by genotype	-
	Meloxicam	*CYP2C9*	No altered effect predicted by genotype	*CPIC*[53]
	Piroxicam	*CYP2C9*	No altered effect predicted by genotype	*CPIC*[53]
	Tenoxicam	*CYP2C9*	No altered effect predicted by genotype	*CPIC*[53]
Opioid Analgesics	Codeine	*CYP2D6* *OPRM1*	Associated with reduced sensitivity to codeine	*CPIC*[44]
	Hydrocodone	*CYP2D6*	No altered effect predicted by genotype	*CPIC*[44]
	Methadone	*CYP2B6*	No altered effect predicted by genotype	-
	Morphine	*OPRM1*	Associated with reduced sensitivity to morphine	*CPIC*[44]
	Oliceridine	*CYP2D6*	No altered effect predicted by genotype	-
	Oxycodone	*CYP2D6*	No altered effect predicted by genotype	*CPIC*[44]
	Tramadol	*CYP2D6*	No altered effect predicted by genotype	*CPIC*[44]
Proton pump inhibitors	Esomeprazole	*CYP2C19*	No altered effect predicted by genotype	*DPWG*[54]
Psychostimulants	Amphetamine	*CYP2D6*	No altered effect predicted by genotype	-
	Dextroamphetamine	*CYP2D6*	No altered effect predicted by genotype	-
	Lisdexamfetamine	*CYP2D6*	No altered effect predicted by genotype	-
Statins	Atorvastatin	*SLCO1B1*	No altered effect predicted by genotype	*CPIC*[55]
	Fluvastatin	*SLCO1B1* *CYP2C9*	No altered effect predicted by genotype	*CPIC*[55]
	Lovastatin	*SLCO1B1*	No altered effect predicted by genotype	*CPIC*[55]
	Pitavastatin	*SLCO1B1*	No altered effect predicted by genotype	*CPIC*[55]
	Pravastatin	*SLCO1B1*	No altered effect predicted by genotype	*CPIC*[55]

MEDICATIONS WITH *USUAL* PRESCRIBING CONSIDERATIONS				
DRUG CATEGORY	MEDICATION	GENE(S) INVOLVED	POTENTIAL CLINICAL ISSUES	PUBLISHED GUIDELINES
	Rosuvastatin	*ABCG2 (rs2231142) SLCO1B1*	Increased drug exposure	*CPIC*[55]
	Simvastatin	*SLCO1B1*	No altered effect predicted by genotype	*CPIC*[55]

LEGEND:
CPIC = Clinical Pharmacogenetics Implementation Consortium
DPWG = The Royal Dutch Pharmacists Association – Pharmacogenetics Working Group
TGA = Therapeutic Goods Administration (Australia)
FDA = Food and Drug Administration (US)

CPIC and DPWG guidelines are available on the PharmGKB website www.pharmgkb.org/view/dosing-guidelines.do

PHARMACOGENOMIC INTERPRETATION

EXPLANATION OF GENETIC RESULTS		
GENE	GENOTYPE	PREDICTED FUNCTION
CYP2D6	*36+*10/*1	*CYP2D6* - Normal metaboliser Due to the presence of one normal function allele and one reduced function allele and one no function allele, this individual is predicted to have a normal metaboliser phenotype. For a drug extensively metabolised by CYP2D6, drug exposure and clinical effects may be expected to lie within the normal range.
CYP2C19	*2/*2	*CYP2C19* - Poor metaboliser Due to the presence of two copies of no function alleles, this individual is predicted to have a poor metaboliser phenotype. For a drug extensively metabolised by CYP2C19, drug exposure and clinical effects may either be greatly increased (for an active drug) or greatly decreased (for a prodrug). This individual is at risk of experiencing adverse effects (active drug) or therapeutic failure (prodrug).
CYP2C9	*1/*1	*CYP2C9* - Normal metaboliser Due to the presence of two normal function alleles, this individual is predicted to have a normal metaboliser phenotype. For a drug extensively metabolised by CYP2C9, drug exposure and clinical effects may be expected to lie within the normal range.
VKORC1	AA	*VKORC1* - Significantly reduced VKORC1 enzyme level The VKORC1 enzyme is predicted to be present in significantly reduced amounts and the response to warfarin will be enhanced. The *CYP2C9* genotype should also be considered together with the *VKORC1* genotype for calculating the initial warfarin dose.
CYP1A2	*1A/*1F	*CYP1A2* - Normal metaboliser Due to the presence of only one copy of the *1F allele, this individual is predicted to have a normal metaboliser phenotype. Normal metabolism of CYP1A2 substrate drugs is predicted. Furthermore, metabolism is not expected to be increased by exposure to inducers such as tobacco smoking and certain dietary components and drugs.
CYP3A4	*1/*1	*CYP3A4* - Normal metaboliser The *22 allele is not present and this individual is expected to have a normal metaboliser phenotype. Whilst many drugs are known to be metabolised by CYP3A4, relatively few genetic variations have been found that affect metabolism of a limited number of these drugs.

EXPLANATION OF GENETIC RESULTS		
GENE	GENOTYPE	PREDICTED FUNCTION
CYP3A5	*1/*3	***CYP3A5* - Intermediate metaboliser** This individual carries one normal functioning allele and one non-functioning allele and is predicted to have an intermediate metaboliser phenotype (CYP3A5 expresser). CYP3A5 is known to metabolise certain drugs, including tacrolimus.
SLCO1B1	*1/*1	***SLCO1B1* - Normal transporter function** The decreased function *5 allele is not present and this individual is predicted to have normal function of the *SLCO1B1* encoded transporter. The transporter is important for the clearance of certain drugs, including simvastatin.
OPRM1	AG	***OPRM1* - Reduced mu opioid receptor expression** The AG genotype contains one normal allele (A) and one variant allele (G) for the OPRM1 gene which encodes the mu opioid receptor. Whilst the evidence around OPRM1 genetic variation continues to develop, it appears that the G allele is associated with a reduced response to certain opioids (in particular, morphine). These findings are supported by a number of cohort studies and at least two meta-analyses[56],[57] however, this is not shown in all studies. For naltrexone in the management of alcohol use disorder, some studies have shown an association of the G allele with superior clinical outcomes. Note the frequency of the variant allele (G) is higher in people of Asian ancestry (around 40%) than European ancestry (around 15%).
CYP2B6	*1/*1	***CYP2B6* - Normal metaboliser** Due to the presence of two normal function alleles, this individual is predicted to have a normal metaboliser phenotype. For a drug extensively metabolised by CYP2B6, drug exposure and clinical effects may be expected to lie within the normal range.
ABCG2 (rs2231142)	AC	***ABCG2 (rs2231142)* - Decreased transporter function** Due to the presence of one copy of the decreased function variant allele A, this individual is predicted to have decreased function of the ABCG2 encoded transporter. Decreased clearance of certain medications such as rosuvastatin is expected.

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This report has been prepared by the myDNA Clinical Team

Laboratory Results provided by: GenSeq Labs (NATA 20082)

TEST SEND OUT: Pharmacogenomics testing and clinical interpretation was performed by GenSeq Labs (a subsidiary of MyDNA) in a NATA accredited laboratory (NATA accredited lab No 20082)

TEST METHODOLOGY AND LIMITATIONS: DNA is extracted from a blood or cheek swab sample and SNP genotyping is performed using open array technology (Life Technologies QuantStudio 12K). CYP2D6 copy number is established by real time PCR (QuantStudio 6), allowing for quantification of up to 4 copies. 3D PCR (QuantStudio 3D) is used to determine which allele is duplicated
Response to medications is complex and may also be influenced by factors which are not tested for (e.g. compliance, concurrent illness, drug-drug interactions.). The test only determines response to indicated medications. Allergic reactions cannot be detected by this genetic test. The test does not detect all known variants in the genes tested. If an individual carries a rare variant not covered by the test, the phenotype may be inaccurately reported.

Unless instructed by their doctor, patients are advised not to alter the dose or stop any medications.

TEST PANEL OF GENES AND VARIANTS: The following clinically actionable alleles are tested: CYP2D6 *2 (LRG_303:g.7870C>T), *3 (LRG_303:g.7569del), *4 (LRG_303:g.[5119C>T; 6047G>A]), *5 (del(CYP2D6)), *6 (LRG_303:g.6727del), *7 (LRG_303:g.7955A>C), *8 (LRG_303:g.[6778G>T; 7870C>T), *9 (LRG_303:g. 7635_7637del), *10 (LRG_303:g.5119C>T), *12 (LRG_303:g.[5143G>A; 7870C>T]), *114 (LRG_303:g.[5119C>T;6778G>A ;7870C>T]), *14 (LRG_303:g.[6778G>A ;7870C>T]), *17 (LRG_303:g.[6041C>T;7870C>T], *29 (LRG_303:g.[7870C>T;8203G>A], *36 (NC_000022.10:g.[42526694G>A ;42522624_42522669con42536337_42536382]), *41(LRG_303:g.[7870C>T; 8008G>A]); CYP2C19 *2(NG_008384.3:g.24179G>A), *3(NG_008384.3:g.22973G>A), *9 (NG_008384.3:g.17809G>A) *17(NG_008384.3:g.4220C>T); CYP2C9 *2(LRG_1195:g.9133C>T), *3(LRG_1195:g.48139A>C), *5 (LRG_1195:g.48144C>G), *6 (LRG_1195:g.16126del), *8 (LRG_1195:g. 9152G>A), *11 (LRG_1195:g. 48067C>T), *27 (LRG_1195:g. 9152G>T); VKORC1 - rs9923231 NM_024006.5:c.-1639G>A; CYP1A2 *1F(LRG_1274:g.5732C>A); CYP3A4 *22(NG_008421.1:g.20493C>T); CYP3A5 *3 (NG_007938.1:g.12083G>A), *6(NG_007938.1:g.19787G>A), *7(NG_007938.1:g.32228dup); SLCO1B1 - rs4149056 NM_006446.4:c.521T>C; OPRM1 - rs1799971 NM_000914.4:c.118A>G; CYP2B6 *4 (LRG_1267:g.23060A>T), *6 (LRG_1267:g.[20638G>T;23060A>T]), *9 (LRG_1267:g.20638G>T), *18.001 (LRG_1267:g.26018T>C), *18.002 (LRG_1267:g.[23060A>T;26018T>C]), *22 (LRG_1267:g.4926T>C) and . The *1 allele denotes the absence of any variant and is designated as the wild type. The *1A allele denotes the absence of the *1F variant for CYP1A2. Only a single variant SNP is tested for the CYP1A2, CYP3A4, SLCO1B1 and OPRM1 genes. All variants are named using the HGVS nomenclature.

CLINICAL SUPPORT

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