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Pharmacogenomic Testing

Pharmacogenomic Testing - Personalised Medicine for safer, faster, more effective treatment

What is Pharmacogenomics?

Pharmacogenomics (PGx) is the study of genetic variations that influence an individual's response to medication. Understanding a patient's genetic profile can help determine whether they are likely to:

- Be at higher risk of side effects of toxicity from their medication
- Have reduced therapeutic benefit
- Respond well to a standard dose

Why PGx Matters

Pharmacogenomic testing supports safer, more effective prescribing by tailoring treatment to each patient's genetic makeup. Benefits include:

- **Reduced adverse drug reactions (ADRs):** PGx-guided prescribing can reduce ADRs by up to 30%, helping patients stay on therapy and avoid hospitalisation[1]. Globally, ADRs account for up to 10% of hospital admissions[2], a significant impact on the health system.
- **Improved treatment outcomes:** Patients prescribed antidepressants with PGx guidance are 70% more likely to achieve remission[3]—supporting faster, more effective treatment.
- **Enhanced safety:** For patients on multiple medications, PGx testing can reduce the risk of drug-drug interaction risk, enhancing safety.[4]
- **Improved treatment adherence and persistence:** Whilst up to 1 in 3 patients discontinue treatment early[5], PGx testing can improve patient adherence rates by boosting their confidence in the safety and efficacy of prescribed medications.
- **Cost effective:** PGx testing leads to substantial healthcare cost savings by optimising medication therapy and reducing adverse events. PGx testing leads to average annual healthcare savings of the equivalent of over AUD$5,900 per patient.[6]

PGx in Everyday Practice

- Over 95% of individuals carry at least one actionable genetic variant[7].
- 1 in 4 patients having a variant requiring an immediate change to medication or dosage[8].
- More than 60% of patients[9] seen in general practice are prescribed medications with known pharmacogenomic interactions. These include antidepressants, opioids and cardiovascular drugs.
- The number of medications with PGx guidelines is growing every year.

These figures highlight the widespread relevance of PGx testing in routine care – not just for complex cases.

Clinical Evidence and Guidelines

Pharmacogenomic testing is supported by national and international guidelines.

The Royal College of Pathologists of Australasia (RCPA), in collaboration with other professional bodies, has developed indications for PGx testing to support clinicians with safer and more effective prescribing[10].

Worldwide, guidelines from the Clinical Pharmacogenetics Implementation Consortium (CPIC)[11] and the Royal Dutch Pharmacist's Association – Pharmacogenetics Working Group are regularly updated and peer reviewed.

They are available at:

- **https://cpicpgx.org/**
- **https://www.pharmgkb.org/guidelineAnnotations**

Mental Health: A Critical Use Case

- Up to 50% of patients don't respond to their first antidepressant they are prescribed[12,13]. This results in trial-and-error prescribing, which leads to prolonged patient suffering, increased healthcare and personal costs, potential disengagement from treatment, and a higher risk for deterioration. It also leads to an increased risk of treatment resistant depression (TRD).
- 30–50% of people with depression meet criteria for TRD, which results in more severe symptoms, poorer outcomes as patients become increasingly disengaged and a higher suicide risk[14,15].
- Up to 30% of patients with TRD attempt suicide[16].
- PGx testing can help identify more effective treatment options earlier, improving outcomes and reducing risk.

When to Consider PGx Testing

Pharmacogenomic testing is valuable in a range of clinical scenarios

These include:

- Before starting new medications with known PGx interactions (e.g. antidepressants, opioids, cardiovascular drugs).
- For patients experiencing side effects or inadequate response.
- When patients are prescribed multiple medications.

Our PGx Multi Panel

Genomic Diagnostics offers a comprehensive PGx panel - the PGx Multi. It analyses 18 genes relevant to over 100 medications across:

- Mental Health, including antidepressants, antipsychotics, anxiolytics and some ADHD medications
- Pain, including opioid analgesics, non-steroidal anti-inflammatory drugs (NSAIDs) and some neuropathic pain medications
- Cardiology, including Clopidogrel and statins
- Gastroenterology, including proton pump inhibitors
- Other therapeutic areas, including oncology

For full details on the PGx Multi panel, please refer to **genomicdiagnostics.com.au**

Interpreting the personalised PGx Multi medication report

The patient's genetic results are released on a detailed report, which provides clinically relevant information about their predicted response to over 100 medications used in clinical practice.

For each medication of interest the report offers:

- **an interpretation of results**
- **actionable recommendations based on international guidelines**

All medications covered by this report are categorized as having **major,** **minor** or **usual** prescribing considerations based on the patient's unique PGx Multi results.

This report provides clinically relevant information about drug metabolism and plasma concentrations (drug exposure), as well as the potential for altered clinical effects.

It is important to list on the patient's request form:

- current medications
- medications considered for the future
- past medications

For many medications covered in this report, evidence-based guidelines and drug label information are available and where relevant are referenced in this report.

Reports are downloaded to your practice management software. Please contact us immediately if this is not occurring.

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.

MEDICATIONS WITH MAJOR PRESCRIBING CONSIDERATIONS		
Medication	**Interpretation**	**Recommendation**
Escitalopram (Antidepressants - SSRIs)	**CYP2C19** - Poor metaboliser: Negligible metabolism oaf escitalopram by CYP2C19 and greatly increased drug exposure are predicted. This may increase the risk of adverse effects.	CPIC guidelines provide a moderate recommendation to consider a 50% dose reduction of the recommended starting dose and titrate to response.

Minor prescribing considerations:

Altered drug response is possible, but the clinical significance is either thought to be minor or there is insufficient data available.

MEDICATIONS WITH MINOR PRESCRIBING CONSIDERATIONS		
Medication	**Interpretation**	**Recommendation**
Ibuprofen (NSAIDs)	**CYP2C9** - Intermediate metaboliser: Mildly reduced metabolism by CYP2C9 and increased drug exposure are predicted. This effect may be exacerbated by high dosages or drug-drug interactions.	CPIC guidelines have a moderate recommendation to initiate therapy with the recommended starting dose. In accordance with prescribing information, use the lowest effective dose for the shortest duration required. Monitor for adverse effects.

Usual prescribing considerations:

Genetic results are not predicted to affect drug response, and there are no additional prescribing considerations.

MEDICATIONS WITH USUAL PRESCRIBING CONSIDERATIONS		
Medication	**Interpretation**	**Recommendation**
Clopidogrel (Antiplatelet drugs)	**CYP2C19** - Normal metaboliser: Normal formation of clopidogrel's active metabolite by CYP2C19 is predicted.	CPIC guidelines provide a strong recommendation to use the label-recommended dosage if clopidogrel is being prescribed for cardiovascular or neurovascular indications.

How to Order PGx Testing

STEP 1: Patient Consultation:

- Discuss PGx Multi testing with your patient.
- Order on standard pathology request form, noting all current, previous and future medications of interest.

STEP 2: Prepare for Collection

- Patient is required to pay for the test prior to having their blood taken.
- Payment occurs online at www.gdpay.com.au
- Patient notes their receipt number on the request form. There is NO Medicare rebate for this test however certain private health insurers do provide a rebate.

STEP 3: Sample collection

- Patient can attend either a collection centre or order an online kit for this test. If they order the kit through our website, the kit is sent to their address, they collect a mouth swab sample themselves and post it back to the lab.

STEP 4: Results discussion

- The comprehensive report is downloaded to your patient management software or is available via Medway.

References:

1. https://pmc.ncbi.nlm.nih.gov/articles/PMC10937656/
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3. https://pubmed.ncbi.nlm.nih.gov/30520364/
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10. https://www.rcpa.edu.au/Library/Practising-Pathology/Pharmacogenomic-Indications-in-Australia
11. https://cpicpgx.org/guidelines/
12. https://pubmed.ncbi.nlm.nih.gov/17074942/
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14. https://pubmed.ncbi.nlm.nih.gov/29665520/
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PGx Medication

Quick Reference List

PGx Medication by Generic Name

Quick Reference List

The table below and overleaf shows the main medications covered by the PGx Multi panel, searchable by their generic name.

Generic Name	Medication Brand Name	Drug Class	Gene
Agomelatine	Domion, Valdoxan	Antidepressants - other	CYP1A2
Allopurinol	Progout, Zyloprin	Drugs for gout	ABCG2
Amitriptyline	Endep, Entrip	Antidepressants - TCAs	CYP2D6 CYP2C19
Aripiprazole	Abilify, Tevaripiprazole, Abyraz, Abilify Maintena	Antipsychotics	CYP2D6
Atazanavir	Reyataz	Antivirals	CYP3A5
Atomoxetine	Strattera	ADHD -miscellaneous agents	CYP2D6
Atorvastatin	Atorvachol, Lipitor, Lorstat, Torvastat, Trovas	Statins	CYP3A4 SLCO1B1
Avatrombopag	Doptelet	Haemostatic agents	CYP2C9
Brexpiprazole	Rexulti	Antipsychotics	CYP2D6
Buproprion	Zyban SR	Antidepressants - other	CYP2B6
Carvedilol	Carvidol, Volirop, Vedilol, Dicarz, Dilatrend, Vedilol, Volirop	Beta blockers	CYP2D6
Celecoxib	Celaxib, Celebrex, Celexi	NSAIDs	CYP2C9
Chlorpheniramine	Chlorphenamine	Antihistamines	CYP2D6
Chlorpromazine	Largactil	Antipsychotics	CYP2D6
Citalopram	Celapram, Cipramil, Talam	Antidepressants - SSRIs	CYP2C19
Clobazam	Frisium	Benzodiazepines	CYP2C19
Clomipramine	Anafranil, Placil	Antidepressants - TCAs	CYP2D6 CYP2C19
Clopidogrel	Clovix, Iscover, Piax, Plidogrel, Plavicor, Plavix	Antiplatelet drugs	CYP2C19
Clozapine	Clopine, Clozaril	Antipsychotics	CYD2D6 CYP1A2
Codeine	Codeine Phosphate, Actacode Linctus, Codeine Linctus	Opioid analgesics	CYP2D6 OPRM1
Cyclophosphamide	Cyclonex, Endoxan	Antineoplastics	CYP2C19
Dapoxetine	Priligy	Drugs for sexual dysfunction	CYP2D6
Darifenacin	Enablex	Anticholinergics (genitourinary)	CYP2D6
Dexamphetamine (a.k.a. Dexamfetamine)	Dexamfetamine	Psychostimulants	CYP2D6
Dexchlorpheniramine	Polaramine	Antihistamines	CYP2D6
Dextromethorphan	Bisolvon Dry Pastilles, Bisolvon Dry, Robitussin Dry Cough Forte	Antitussives	CYP2D6
Diazepam	Antenex, Valium, Valpam, Diazepam Elixir, Diazepam Rectal Solution	Benzodiazepines	CYPC219
Diclofenac	Voltaren Rapid, Difenac, Clonac, Fenac, Voltaren, Viclofen, Cambia, Dencorub Anti-inflammatory Gel, Voltaren Emulgel, Voltaren Osteo Gel 12 Hourly, Inflamax	NSAIDs	CYP2C9
Donepezil	Arazil, Aricept	Anticholinesterases	CYP2D6
Dothiepin (a.ka. Dosulepin)	Dothep	Antidepressants - TCAs	CYP2D6 CYP2C19
Doxepin	Deptran	Antidepressants - TCAs	CYP2D6 CYP2C19
Duloxetine	Cymbalta, Duloxecor, Dytrex, Tixol	Antidepressants - SNRIs	CYP1A2 CYP2D6
Efavirenz	Sustiva, Stocrin	Antivirals	CYP2B6
Eliglustat	Cerdelga	Miscellaneous	CYP2D6
Escitalopram	Esipram, Lexapro, Cilopam-S, Lexam, Loxalate	Antidepressants - SSRIs	CYP2C19
Esomeprazole	Esopreze, Nexium, Nexole, Noxicid Heartburn Relief, Noxicid, Nexium 24HR Once Daily Dosing	Proton pump inhibitors	CYP2C19
Flecainide	Flecatab, Tambocor	Antiarrhythmics	CYP2D6
Fluoxetine	Fluotex, Lovan, Prozac, Zactin	Antidepressants - SSRIs	CYP2C9 CYP2D6
Fluvastatin	Lescol XL	Statins	CYP2C9 SLCO1B1
Fluvoxamine	Faverin, Luvox, Movox	Antidepressants - SSRIs	CYP1A2 CYP2D6
Fosphenytoin	Cerebyx	Antiepileptics	CYP2C9
Galantamine	Galantyl, Gamine XR, Reminyl	Anticholinesterases	CYP2D6
Gefitinib	Iressa	Immunomodulators and antineoplastics	CYP2D6
Glibenclamide	Daonil	Antidiabetics	CYP2C9
Gliclazide	Glyade MR, Diamicron MR, Glyade, Nidem	Antidiabetics	CYP2C19 CYP2C9
Glimepiride	Amaryl, Dimirel	Antidiabetics	CYP2C9
Glipizide	Minidiab	Antidiabetics	CYP2C9
Haloperidol	Serenace, Haldol	Antipsychotics	CYP2D6
Ibuprofen	Advil, Advil 12 Hour, Advil Liquid, Nurofen, Nurofen 12 Hour, Nurofen Double Strength, Nurofen Liquid, Brufen, Bugesic, Advil Children's, FenPaed, Advil Infant's, FenPaed Double Strength, Nurofen for Children 5–12 years, Nurofen Gel, Pedea, Caldolor	NSAIDs	CYP2C9

Generic Name	Medication Brand Name	Drug Class	Gene
Imipramine	Tofranil	Antidepressants - TCAs	CYP2D6 CYP2C19
Indomethacin (a.k.a. Indometacin)	Arthrexin, Indocid	NSAIDs	CYP2C9
Irbesartan	Abisart, Avapro, Avsartan, Karvea	Angiotensin receptor blockers	CYP2C9
Lansoprazole	Zopral, Lanzopran, Zopral, Zopral ODT, Zoton FasTabs	Proton pump inhibitors	CYP2C19
Lisdexamfetamine	Vyvanse	Psychostimulants	CYP2D6
Losartan	Cozavan, Cozaar	Angiotensin receptor blockers	CYP2C9
Mefenamic Acid	Ponstan	NSAIDs	CYP2C9
Melatonin	Slenyto, Circadin, Melotin	Hypnotics	CYP1A2
Meloxicam	Melobic, Meloxibell, Mobic, Moxicam	NSAIDs	CYP2C9
Methadone	Physeptone, Phebra	Opioid Analgesics	CYP2B6
Metoclopramide	Pramin, Emexlon, Maxolon	Antiemetics	CYP2D6
Metoprolol	Betaloc, Lopresor, Metrol, Minax, Mistrom, Metrol-XL, Minax XL, Toprol-XL	Beta blockers	CYP2D6
Mianserin	Lumin	Antidepressants - other	CYP2D6
Mirtazapine	Avanza, Axit, Mirtanza	Antidepressants - other	CYP1A2 CYP2D6
Moclobemide	Amira, Aurorix, Clobemix	Antidepressants - other	CYP2C19
Morphine	Sevredol, Anamorph, Ordine, Morphine hydrochloride, Morphine sulfate, MS Contin, Momex SR, Kapanol, MS Mono	Opioid Analgesics	OPRM1
Naltrexone	Naltrexone, Contrave (Naltrexone + Bupropion)	Drugs for alcohol dependence	OPRM1
Nebivolol	Nebilet, Nepiten	Beta blockers	CYP2D6
Nevirapine	Viramune	Antivirals	CYP2B6
Nortriptyline	Allegron, NortriTABS	Antidepressants - TCAs	CYP2D6
Olanzapine	Ozin, Pryzex, Zypine, Zyprexa, Zypine ODT, Zyprexa Zydis, Zyprexa Relprevv	Antipsychotics	CYP1A2
Omeprazole	Acimax, Losec, Maxor, Omepral, Ozmep, Pemzo, Probitor, Maxor Heartburn Relief	Proton pump inhibitors	CYP2C19
Ondansetron	Zofran, Zotren, Zofran Zydis	Antiemetics	CYP2D6
Oxycodone	Endone, Oxycodone, Novacodone, OxyContin, OxyNorm, Proladone	Opioid Analgesics	CYP2D6
Pantoprazole	Gastenz, Salpraz Heartburn Relief, Somac Heartburn Relief, Ozpan, Panthron, Somac, Sozol	Proton pump inhibitors	CYP2C19
Paroxetine	Paxtine, Aropax, Extine	Antidepressants - SSRIs	CYP2D6
Perhexiline	Pexsig	Antianginals	CYP2D6
Phenytoin	Dilantin, Dilantin Infatabs, Dilantin Paediatric Suspension	Antiepileptics	CYP2C9
Piroxicam	Feldene-D, Mobilis D, Feldene, Mobilis	NSAIDs	CYP2C9
Pravastatin	Cholstat, Lipostat, Pravachol	Statins	SLCO1B1
Proguanil	Atovaquone + Proguanil (Malarone, Malarone Junior, Promozio)*	Miscellaneous	CYP2C19
Promethazine	Allersoothe, Fenezal, Phenergan, Promethazine Hydrochloride, Allersoothe Elixir, Phenergan Elixir	Antihistamines	CYP2D6
Propranolol	Deralin, Inderal	Beta blockers	CYP1A2 CYP2D6
Quetiapine	Kaptan, Quetia, Seroquel, Syquet, Quepine XR, Quetia XR, Seroquel XR, Tevatiapine XR	Antipsychotics	CYP3A4
Rabeprazole	Parbezol, Pariet, Zabep	Proton pump inhibitors	CYP2C19
Risperidone	Rispa, Risperdal, Ozidal, Rispernia, Rixadone, Risperdal Consta	Antipsychotics	CYP2D6
Rosuvastatin	Cavstat, Crestor, Crosuva	Statins	SLCO1B1, ABCG2
Sertraline	Sertra, Setrona, Eleva, Zoloft	Antidepressants - SSRIs	CYP2C19, CYP2B6
Simvastatin	Zimstat, Lipex, Simvar, Zocor	Statins	CYP3A4 SLCO1B1
Siponimod	Mayzent	Neurological drugs	CYP2C9
Tacrolimus (a.k.a FK-506)	Pacrolim, Prograf, Tacrograf, Advagraf XL	Calcineurin inhibitors	CYP3A5
Tamoxifen	Genox, Nolvadex-D, Tamosin	Immunomodulators and antineoplastics	CYP2D6
Tamsulosin	Flomaxtra	Miscellaneous	CYP2D6
Tetrabenazine	Tetrabenazine	Neurological drugs	CYP2D6
Timolol	Timoptol-XE, Timoptol	Beta blockers	CYP2D6
Tolterodine	Detrusitol	Anticholinergics (genitourinary)	CYP2D6
Tramadol	Tramal SR, Tramedo SR, Zydol SR, Tramal, Tramedo, Zydol, Tramal Oral Drops	Opioid Analgesics	CYP2D6
Tropisetron	Tropisetron	Antiemetics	CYP2D6
Venlafaxine	Efexor-XR, Elaxine-SR, Enlafax-XR	Antidepressants - SNRIs	CYP2D6
Voriconazole	Vfend, Vttack, Vzole	Antifungals - azoles	CYP2C19
Vortioxetine	Brintellix	Antidepressants - other	CYP2D6
Warfarin	Coumadin, Marevan	Anticoagulants	VKORC1 CYP2C9
Zuclopenthixol	Clopixol, Clopixol Acuphase, Clopixol Depot	Antipsychotics	CYP2D6

PGx Medication by Major Drug Class

Quick Reference List

The table below and overleaf shows the main medications covered by the PGx panels, sorted by drug class and listing common brands.

Drug Class	Gene	Medication	
		Generic Name	Brand Name
ADHD -miscellaneous agents	CYP2D6	Atomoxetine	Strattera
Angiotensin receptor blockers	CYP2C9	Irbesartan	Abisart, Avapro, Avsartan, Karvea
	CYP2C9	Losartan	Cozavan, Cozaar
Antianginals	CYP2D6	Perhexiline	Pexsig
Antiarrhythmics	CYP2D6	Flecainide	Flecatab, Tambocor
Anticholinergics (genitourinary)	CYP2D6	Darifenacin	Enablex
	CYP2D6	Tolterodine	Detrusitol
Anticholinesterases	CYP2D6	Donepezil	Arazil, Aricept
	CYP2D6	Galantamine	Galantyl, Gamine XR, Reminyl
Anticoagulants	VKORC1, CYP2C9	Warfarin	Coumadin, Marevan
Antidepressants - other	CYP1A2	Agomelatine	Domion, Valdoxan
	CYP2B6	Buproprion	Zyban SR
	CYP2D6	Mianserin	Lumin
	CYP1A2 CYP2D6	Mirtazapine	Avanza, Axit, Mirtanza
	CYP2C19	Moclobemide	Amira, Aurorix, Clobemix
	CYP2D6	Vortioxetine	Brintellix
Antidepressants - SNRIs	CYP1A2 CYP2D6	Duloxetine	Cymbalta, Duloxecor, Dytrex, Tixol
	CYP2D6	Venlafaxine	Efexor-XR, Elaxine-SR, Enlafax-XR
Antidepressants - SSRIs	CYP2C19	Citalopram	Celapram, Cipramil, Talam
	CYP2C19	Escitalopram	Esipram, Lexapro, Cilopam-S, Lexam, Loxalate
	CYP2C9, CYP2D6	Fluoxetine	Fluotex, Lovan, Prozac, Zactin
	CYP1A2, CYP2D6	Fluvoxamine	Faverin, Luvox, Movox
	CYP2D6	Paroxetine	Paxtine, Aropax, Extine
	CYP2C19, CYP2B6	Sertraline	Sertra, Setrona, Eleva, Zoloft
Antidepressants - TCAs	CYP2D6 CYP2C19	Amitriptyline	Endep, Entrip
	CYP2D6, CYP2C19	Clomipramine	Anafranil, Placil
	CYP2D6, CYP2C19	Dothiepin (a.ka. Dosulepin)	Dothep
	CYP2D6, CYP2C19	Doxepin	Deptran
	CYP2D6, CYP2C19	Imipramine	Tofranil
	CYP2D6	Nortriptyline	Allegron, NortriTABS
Antidiabetics	CYP2C9	Glibenclamide	Daonil
	CYP2C19, CYP2C9	Gliclazide	Glyade MR, Diamicron MR, Glyade, Nidem
	CYP2C9	Glimepiride	Amaryl, Dimirel
	CYP2C9	Glipizide	Minidiab
Antiemetics	CYP2D6	Metoclopramide	Pramin, Emexlon, Maxolon
	CYP2D6	Ondansetron	Zofran, Zotren, Zofran Zydis
	CYP2D6	Tropisetron	Tropisetron
Antiepileptics	CYP2C9	Fosphenytoin	Cerebyx
	CYP2C9	Phenytoin	Dilantin, Dilantin Infatabs, Dilantin Paediatric Suspension
Antifungals - azoles	CYP2C19	Voriconazole	Vfend, Vttack, Vzole
Antihistamines	CYP2D6	Chlorpheniramine	Chlorphenamine
	CYP2D6	Dexchlorpheniramine	Polaramine
	CYP2D6	Promethazine	Allersoothe, Fenezal, Phenergan, Promethazine Hydrochloride, Allersoothe Elixir, Phenergan Elixir
Antineoplastics	CYP2C19	Cyclophosphamide	Cyclonex, Endoxan
Antiplatelet drugs	CYP2C19	Clopidogrel	Clovix, Iscover, Piax, Plidogrel, Plavicor, Plavix
Antipsychotics	CYP2D6	Aripiprazole	Abilify, Tevaripiprazole, Abyraz, Abilify Maintena
	CYP2D6	Brexpiprazole	Rexulti
	CYP2D6	Chlorpromazine	Largactil
	CYD2D6, CYP1A2	Clozapine	Clopine, Clozaril
	CYP2D6	Haloperidol	Serenace, Haldol
	CYP1A2	Olanzapine	Ozin, Pryzex, Zypine, Zyprexa, Zypine ODT, Zyprexa Zydis, Zyprexa Relprevv
	CYP3A4	Quetiapine	Kaptan, Quetia, Seroquel, Syquet, Quepine XR, Quetia XR, Seroquel XR, Tevatiapine XR
	CYP2D6	Risperidone	Rispa, Risperdal, Ozidal, Rispernia, Rixadone, Risperdal Consta
	CYP2D6	Zuclopenthixol	Clopixol, Clopixol Acuphase, Clopixol Depot

Drug Class	Gene	Medication	
		Generic Name	Brand Name
Antitussives	CYP2D6	Dextromethorphan	Bisolvon Dry Pastilles, Bisolvon Dry, Robitussin Dry Cough Forte
Antivirals	CYP3A5	Atazanavir	Reyataz
	CYP2B6	Efavirenz	Sustiva, Stocrin
	CYP2B6	Nevirapine	Viramune
Benzodiazepines	CYP2C19	Clobazam	Frisium
	CYPC219	Diazepam	Antenex, Valium, Valpam, Diazepam Elixir, Diazepam Rectal Solution
Beta blockers	CYP2D6	Carvedilol	Carvidol, Volirop, Vedilol, Dicarz, Dilatrend, Vedilol, Volirop
	CYP2D6	Metoprolol	Betaloc, Lopresor, Metrol, Minax, Mistrom, Metrol-XL, Minax XL, Toprol-XL
	CYP2D6	Nebivolol	Nebilet, Nepiten
	CYP1A2, CYP2D6	Propranolol	Deralin, Inderal
	CYP2D6	Timolol	Timoptol-XE, Timoptol
Calcineurin inhibitors	CYP3A5	Tacrolimus (a.k.a FK-506)	Pacrolim, Prograf, Tacrograf, Advagraf XL
Drugs for alcohol dependence	OPRM1	Naltrexone	Naltrexone, Contrave (Naltrexone + Bupropion)
Drugs for gout	ABCG2	Allopurinol	Progout, Zyloprin
Drugs for sexual dysfunction	CYP2D6	Dapoxetine	Priligy
Haemostatic agents	CYP2C9	Avatrombopag	Doptelet
Hypnotics	CYP1A2	Melatonin	Slenyto, Circadin, Melotin
Immunomodulators and antineoplastics	CYP2D6	Gefitinib	Iressa
	CYP2D6	Tamoxifen	Genox, Nolvadex-D, Tamosin
Miscellaneous	CYP2D6	Eliglustat	Cerdelga
	CYP2C19	Proguanil	Atovaquone + Proguanil (Malarone, Malarone Junior, Promozio)*
	CYP2D6	Tamsulosin	Flomaxtra
Neurological drugs	CYP2C9	Siponimod	Mayzent
	CYP2D6	Tetrabenazine	Tetrabenazine
NSAIDs	CYP2C9	Celecoxib	Celaxib, Celebrex, Celexi
	CYP2C9	Diclofenac	Voltaren Rapid, Difenac, Clonac, Fenac, Voltaren, Viclofen, Cambia, Dencorub Anti-inflammatory Gel, Voltaren Emulgel, Voltaren Osteo Gel 12 Hourly, Inflamax
	CYP2C9	Ibuprofen	Advil, Advil 12 Hour, Advil Liquid, Nurofen, Nurofen 12 Hour, Nurofen Double Strength, Nurofen Liquid, Brufen, Bugesic, Advil Children's, FenPaed, Advil Infant's, FenPaed Double Strength, Nurofen for Children 5–12 years, Nurofen Gel, Pedea, Caldolor
	CYP2C9	Indomethacin (a.k.a. Indometacin)	Arthrexin, Indocid
	CYP2C9	Mefenamic Acid	Ponstan
	CYP2C9	Meloxicam	Melobic, Meloxibell, Mobic, Moxicam
	CYP2C9	Piroxicam	Feldene-D, Mobilis D, Feldene, Mobilis
Opioid analgesics	CYP2D6, OPRM1	Codeine	Codeine Phosphate, Actacode Linctus, Codeine Linctus
	CYP2B6	Methadone	Physeptone, Phebra
	OPRM1	Morphine	Sevredol, Anamorph, Ordine, Morphine hydrochloride, Morphine sulfate, MS Contin, Momex SR, Kapanol, MS Mono
	CYP2D6	Oxycodone	Endone, Oxycodone, Novacodone, OxyContin, OxyNorm, Proladone
	CYP2D6	Tramadol	Tramal SR, Tramedo SR, Zydol SR, Tramal, Tramedo, Zydol, Tramal Oral Drops
Proton pump inhibitors	CYP2C19	Esomeprazole	Esopreze, Nexium, Nexole, Noxicid Heartburn Relief, Noxicid, Nexium 24HR Once Daily Dosing
	CYP2C19	Lansoprazole	Zopral, Lanzopran, Zopral, Zopral ODT, Zoton FasTabs
	CYP2C19	Omeprazole	Acimax, Losec, Maxor, Omepral, Ozmep, Pemzo, Probitor, Maxor Heartburn Relief
	CYP2C19	Pantoprazole	Gastenz, Salpraz Heartburn Relief, Somac Heartburn Relief, Ozpan, Panthron, Somac, Sozol
	CYP2C19	Rabeprazole	Parbezol, Pariet, Zabep
Psychostimulants	CYP2D6	Dexamphetamine (a.k.a. Dexamfetamine)	Dexamfetamine
	CYP2D6	Lisdexamfetamine	Vyvanse
Statins	CYP3A4, SLCO1B1	Atorvastatin	Atorvachol, Lipitor, Lorstat, Torvastat, Trovas
	CYP2C9, SLCO1B1	Fluvastatin	Lescol XL
	SLCO1B1	Pravastatin	Cholstat, Lipostat, Pravachol
	SLCO1B1, ABCG2	Rosuvastatin	Cavstat, Crestor, Crosuva
	CYP3A4, SLCO1B1	Simvastatin	Zimstat, Lipex, Simvar, Zocor

Interpreting the personalised PGx medication report

The patient's genetic results are released on a detailed report, which provides clinically relevant information about their predicted response to over 100 medications used in clinical practice.

All medications covered by this report are categorized as having **major, minor** or **usual** prescribing considerations based on the patient's unique PGx results.

This report provides clinically relevant information about drug metabolism and plasma concentrations (drug exposure), as well as the potential for altered clinical effects.

For each medication of interest the report offers:

- an interpretation of results
- action recommendations based on international guidelines

It is important to list on the patient's request form:

- current medications
- medications considered for the future
- past medications

For many medications covered in this report, evidence-based guidelines and drug label information are available and where relevant are referenced in this report.

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.

MEDICATIONS WITH MAJOR PRESCRIBING CONSIDERATIONS		
Medication	**Interpretation**	**Recommendation**
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 provide a moderate recommendation to consider a 50% dose reduction of the recommended starting dose and titrate to response.

Minor prescribing considerations:

Altered drug response is possible, but the clinical significance is either thought to be minor or there is insufficient data available.

MEDICATIONS WITH MINOR PRESCRIBING CONSIDERATIONS		
Medication	**Interpretation**	**Recommendation**
Ibuprofen (NSAIDs)	**CYP2C9** - Intermediate metaboliser: Mildly reduced metabolism by CYP2C9 and increased drug exposure are predicted. This effect may be exacerbated by high dosages or drug-drug interactions.	CPIC guidelines have a moderate recommendation to initiate therapy with the recommended starting dose. In accordance with prescribing information, use the lowest effective dose for the shortest duration required. Monitor for adverse effects.

Usual prescribing considerations:

Genetic results are not predicted to affect drug response, and there are no additional prescribing considerations.

MEDICATIONS WITH USUAL PRESCRIBING CONSIDERATIONS		
Medication	**Interpretation**	**Recommendation**
Clopidogrel (Antiplatelet drugs)	**CYP2C19** - Normal metaboliser: Normal formation of clopidogrel's active metabolite by CYP2C19 is predicted.	CPIC guidelines provide a strong recommendation to use the label-recommended dosage if clopidogrel is being prescribed for cardiovascular or neurovascular indications.

References:

Australian Medicines Handbook 2020 (online). Adelaide: Australian Medicines Handbook Pty Ltd; 2020 July. Available from: https://amhonline.amh.net.au/

Australian Government Department of Health Therapeutic Goods Administration. Extract from the Clinical Evaluation Report for Eliglustat (as tartrate). ACT: Therapeutic Goods Administration; 2015. Available from: https://www.tga.gov.au/sites/default/files/auspar-eliglustat-150818-cer.pdf

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Pharmacogenomic Testing Quick Guide

Key Genes, Pathways, and Medications

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Pharmacogenomic (PGx) testing helps guide personalised medication plans for a range of conditions. This quick guide provides an overview of the key genes analysed in the PGx Multi panel and the major medications affected by variations in these genes and their associated metabolic pathways.

CYP2C19

Antidepressants	Anxiolytics	Antiplatelet Drugs	Proton Pump Inhibitors
Amitriptyline	Clobazam	Clopidogrel	Esomeprazole
Citalopram	Diazepam	Prasugrel	Lansoprazole
Clomipramine			Omeprazole
Dosulepin			Pantoprazole
Doxepin			Rabeprazole
Escitalopram			
Imipramine			
Moclobemide			
Sertraline			

CYP2D6

Antidepressants		Antipsychotics	Opioid Pain Relief	Dementia	ADHD
Amitriptyline	Imipramine	Aripiprazole	Codeine*	Donepezil	Atomoxetine
Clomipramine	Mianserin	Brexpiprazole	Oxycodone	Galantamine	Dexamphetamine
Desvenlafaxine	Mirtazapine	Chlorpromazine	Tramadol*		Lisdexamphetamine
Dosulepin	Nortriptyline	Clozapine			
Doxepin	Paroxetine	Flupenthixol			
Duloxetine	Venlafaxine	Haloperidol			
Fluoxetine	Vortioxetine	Risperidone			
Fluvoxamine		Zuclopenthixol			

SLCO1B1

Statins
Atorvastatin
Fluvastatin
Lovastatin
Pitavastatin
Pravastatin
Rosuvastatin
Simvastatin

CYP2C9

Antidepressants	Antiepileptics	NSAIDs	Antidiabetics
Fluoxetine	Fosphenytoin	Celecoxib	Glibenclamide
	Phenytoin	Diclofenac	Gliclazide
		Ibuprofen	Glimepiride
		Indomethacin	Glipizide
		Mefanamic Acid	Tolbutamide
		Meloxicam	
		Piroxicam	

CYP1A2

Antidepressants	Antipsychotics	Other
Agomelatine	Clozapine	Melatonin (Sleep)
Duloxetine	Olanzapine	
Fluvoxamine		
Mirtazapine		

OPRM1

Opioid Pain Relief	Drugs for Alcohol dependence
Codeine*	Naltrexone
Morphine	
Oxycodone	
Tramadol*	

*Prodrug

CYP2B6

Antidepressants	Opioid Pain Relief
Buproprion	Methadone
Sertraline	

CYP3A4

Antipsychotics	Antiplatelet Drugs
Quetiapine	Ticagrelor

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