RESULTS REPORT

PATIENT NAME

Name Lastname

PATIENT IDENTIFICATION

NPGUS99999

Date of Birth: Aug 5, 1990

Gender: Male

SAMPLE INFORMATION

Date Collected: Jul 17, 2023

Date Accessioned: Jul 17, 2023

Specimen Type: NFG Swab

Sample Code: NPGUS99999

PRE-EXISTING CONDITIONS & MEDICATIONS

Selected Age: Adults, aged 18 to 65

Diet and supplements selected: Caffeine

Selected psychotropic drugs: Lamotrigine; Venlafaxine

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REQUESTING DOCTOR:

CHRISTOPHER PELIC

Hospital/Clinic:

Dr Chris Pelic

SUMMARY TABLE

An initial interpretation of the results obtained from the patients genetic profile is displayed in a table below. For each drug examined, the result is indicated according to the following code:

- No genetic variants relevant to the treatment have been found. Use as directed.
- Increased likelihood of positive response and/or lower risk of adverse drug reactions.
- Need for drug dose monitoring and/or less likelihood of positive response.
- Increased risk of adverse drug reactions.
- Contraindication
- Combination not advised
- Monitor parameters
  - Increase dose
  - Decrease dose
- Warning / Information

ANTIDEPRESSANTS

SSRI

Citalopram *(Celexa®)*	⚠
Escitalopram *(Lexapro®)*	⚠
Fluoxetine *(Prozac®)*	⚠
Fluvoxamine *(Luvox®)*	⚠
Paroxetine *(Paxil®)*	⚠
Sertraline *(Zoloft®)*	⚠

SNRI

Desvenlafaxine *(Pristiq®)*	⚠
Duloxetine *(Cymbalta®)*	⚠
Venlafaxine *(Effexor®)*	

ATYPICAL

Bupropion *(Wellbutrin®)*	⚠
Mirtazapine *(Remeron®)*	ⓘ
Trazodone *(Desyrel®)*	⚠
Vortioxetine *(Trintellix®)*	⚠

TCA

Amitriptyline *(Elavil®)*	⚠
Clomipramine *(Anafranil®)*	⚠
Desipramine *(Norpramin®)*	⚠
Doxepin *(Sinequan®)*	⚠
Imipramine *(Tofranil®)*	⚠
Nortriptyline *(Pamelor®)*	⚠

MOOD STABILIZERS AND ANTICONVULSANTS

MOOD STABILIZERS

Carbamazepine *(Tegretol®)*	⚠
Lamotrigine *(Lamictal®)*	
Lithium *(Eskalith®)*	⚠
Valproic Acid *(Depakote®)*	⚠

OTHER MEDICATIONS OF INTEREST

Eslicarbazepine	⚠
Levetiracetam	
Oxcarbazepine *(Trileptal®)*	⚠
Phenobarbital	⚠
Phenytoin	⚠
Topiramate *(Topamax®)*	
Vigabatrin	
Zonisamide	

ANXIOLYTICS / SLEEP DRUGS

Alprazolam *(Xanax®)*	
Buspirone *(BuSpar®)*	⚠
Clonazepam *(Klonopin®)*	
Eszopiclone *(Lunesta®)*	
Lorazepam *(Ativan®)*	
Zolpidem *(Ambien®)*	

SUBSTANCE USE

Methadone	⚠
Naloxone	
Naltrexone	

ANTIPSYCHOTICS

2nd GENERATION

Aripiprazole *(Abilify®)*	
Brexpiprazole	
Clozapine *(Clozaril®)*	⚠
Iloperidone *(Fanapt®)*	⚠
Lurasidone *(Latuda®)*	
Olanzapine *(Zyprexa®)*	
Paliperidone *(Invega®)*	⚠
Quetiapine *(Seroquel®)*	
Risperidone *(Risperdal®)*	

1st GENERATION

Haloperidol *(Haldol®)*	⚠
Perphenazine *(Trilafon®)*	⚠
Pimozide	⚠
Thioridazine *(Mellaril®)*	⊗

ADHD, NARCOLEPSY & BINGE EATING

STIMULANTS

Amphetamines *(Adderall®)*	⚠
Lisdexamfetamine	⚠
Methylphenidate *(Ritalin®...)*	⚠

NON-STIMULANTS

Atomoxetine *(Strattera®)*	

GENETIC RESULTS

PATIENT'S METABOLIZING PROFILE		
Gene	**Diplotype**	**Predicted Phenotype**
CYP1A2	*1F/*1F	Ultrarapid metabolizer
CYP2B6	*1/*1	Normal metabolizer
CYP2C9	*1/*1	Normal metabolizer
CYP2C19	*17/*17	Ultrarapid metabolizer
CYP2D6	(*1/*6)7N	Ultrarapid metabolizer
CYP3A4	*1/*1	Normal metabolizer

OTHER VARIANTS		
Gene	**Variant**	**Genotype**
ABCB1	rs11983225	T/T
ABCB1	rs2235048	G/G
AKT1	rs1130214	A/C
AL157359	rs75222709	T/T
AL157359	rs78015114	T/T
BDNF	p.Val66Met	C/C
CES1	p.Gly143Glu	C/C
COMT	p.Val158Met	A/G
DDIT4	rs1053639	A/T
EPHX1	p.Tyr113His	C/T
FCHSD1	rs456998	G/G
GRIK2	rs2518224	A/A
GRIK4	rs1954787	T/T
HLA-A	rs1061235	A/A
HTR2A	c.-1438G>A	T/T
HTR2A	rs9316233	C/G
HTR2C	rs1414334	C/C
LPHN3	rs6551665	A/G
MTHFR	C677T	C/T
OPRM1	c.118A>G	A/G
RPTOR	rs7211818	A/A
SLC6A4	5HTTLPR	L/S
UGT2B15	D85Y	A/C

FOLIC ACID CONVERSION		
Gene	**Genotype**	**Predicted Phenotype**
***MTHFR* (C677T)**	C/T	Slightly reduced MTHFR enzyme activity

RESULTS

This section contains the detailed list of drugs with the associated genetic results and interpretation. When different genetic results indicated in different colors occur at the same time for a given drug, the resulting color in the summary table will follow this safety priority rule: risk of adverse drug reactions (red) > dose monitoring (amber) > increased likelihood of positive response and/or lower risk of adverse drug reactions (green). In addition, information regarding interactions resulting from the data entered on the patient information tab is also shown (symbols in the summary table). When different important interactions identified with different symbols occur at the same time for a given drug, the symbol displayed in the summary table will follow this priority rule: Contraindication > Combination not advised > Modify regiment and/or monitor parameters > Warning / Information. The final evaluation of the analysis results is at the physician´s discretion.

Pharmacogenetics and interactions

DRUG	RESULTS AND INTERPRETATION

Agomelatine

Analysis result:

Ultrarapid metabolizer of the drug (*CYP1A2*).

Interpretation:

The patient carries a variant that has been associated with an increased drug metabolism (CYP1A2). Therefore, he/she may experience a lower exposure to the drug.

Information about interactions:

No interactions of interest with this drug have been detected.

Alprazolam
(Xanax®)

Analysis result:

No variations related to response and/or metabolism that are different from the population standard were found in the analyzed genes.

Interpretation:

Use as directed.

Information about interactions:

No interactions of interest with this drug have been detected.

Amitriptyline
(Elavil®)

Analysis result:

Ultrarapid metabolizer of the drug (*CYP2C19, CYP2D6*).

Interpretation:

The analysis indicates that the patient is a CYP2C19 ultrarapid and a CYP2D6 ultrarapid metabolizer of this drug. Consider an alternative drug not metabolized by this pathway. If this drug is warranted, consider increasing the recommended starting dose.[1] Use therapeutic drug monitoring to guide dose adjustments[3].

Information about interactions:

[Venlafaxine]

⚠ Monitor: Increased risk of QT prolongation, hyponatraemia, serotonin syndrome and other adverse effects (additive effects). Increase medical surveillance and monitor plasma levels of sodium.

Amphetamines
(Adderall®)

Analysis result:

Ultrarapid metabolizer of the drug (*CYP2D6*).

Interpretation:

The analysis indicates that the patient is a CYP2D6 ultrarapid metabolizer of this drug. However, there is no evidence suggesting a clinical effect of this phenotype; therefore use as directed and titrate dose in response to efficacy and adverse drug events.

Information about interactions:

[Caffeine]

Not recommended: Risk of increased anxiety, irritability, nausea, insomnia or tremors.

[Venlafaxine]

Not recommended: Risk of serotonin syndrome. Use an alternative, or start the treatment with low doses and monitor the patient closely.

[Lamotrigine]

Monitor: Risk of lower seizure threshold. Administer combination with caution in patients on treatment of epilepsy/crisis seizures; consider discontinuing Amphetamines in the event of seizures.

Aripiprazole
(Abilify®)

Analysis result:

Ultrarapid metabolizer of the drug (*CYP2D6*).

Interpretation:

The analysis indicates that the patient is a CYP2D6 ultrarapid metabolizer of this drug. If needed, increase the drug dosage.

Information about interactions:

No interactions of interest with this drug have been detected.

Atomoxetine
(Strattera®)

Analysis result:

Ultrarapid metabolizer of the drug (*CYP2D6*).

Interpretation:

The analysis indicates that the patient is a CYP2D6 ultrarapid metabolizer of this drug. Be alert to reduced efficacy or select alternative drug.

Information about interactions:

No interactions of interest with this drug have been detected.

Brexpiprazole

Analysis result:

Ultrarapid metabolizer of the drug (*CYP2D6*).

Interpretation:

The analysis indicates that the patient is a CYP2D6 ultrarapid metabolizer of this drug. However, there is no evidence suggesting a clinical effect of this phenotype; therefore, use as directed and titrate dose in response to efficacy and adverse drug events.

Information about interactions:

No interactions of interest with this drug have been detected.

Bupropion
(Wellbutrin®)

Analysis result:

No variations related to response and/or metabolism that are different from the population standard were found in the analyzed genes.

Interpretation:

Use as directed.

Information about interactions:

[Venlafaxine]

⚠ Monitor: Risk of seizures (additive effects). Start treatment with Bupropion with lower dosages.

Buspirone
(BuSpar®)

Analysis result:

No variations related to response and/or metabolism that are different from the population standard were found in the analyzed genes.

Interpretation:

Use as directed.

Information about interactions:

[Venlafaxine]

⚠ Monitor: Increased risk of serotonin syndrome. Maximize medical surveillance.

Carbamazepine
(Tegretol®)

Analysis result:

Faster detoxification of the drug (*EPHX1*).

Interpretation:

The analysis indicates that a higher dose than standard may be necessary to achieve therapeutic effects (EPHX1).

Information about interactions:

[Lamotrigine]

Monitor: Risk of reduced plasma levels of Lamotrigine; increase dose of Lamotrigine (see additional information for specific dose recommendation). Risk of ataxia, dizziness, diplopia and blurred vision. Risk of increased plasma levels of Carbamazepine epoxide.

[Venlafaxine]

⚠ Monitor: Risk of serotonin syndrome and hyponatraemia, among others (additive effects). Monitor plasma sodium levels.

[Caffeine]

ⓘ Warning: Risk of reduced plasma levels of Caffeine (induced hepatic metabolism).

Citalopram
(Celexa®)

Analysis result:

Ultrarapid metabolizer of the drug (*CYP2C19*).

Interpretation:

The analysis indicates that the patient is a CYP2C19 ultrarapid metabolizer of this drug. Consider an alternative drug not predominantly metabolized by this pathway.

Information about interactions:

[Venlafaxine]

⚠ Not recommended: Increased risk of QT prolongation, serotonin syndrome, hyponatraemia and other adverse effects (additive effects).

Clobazam

Analysis result:

- The patient carries a variant that has been associated with resistance to antiepileptic drugs in adult patients under polymedication (*ABCB1*).
- Ultrarapid metabolizer of the drug (*CYP2C19*).

Interpretation:

The analysis indicates that the patient is a CYP2C19 ultrarapid metabolizer of this drug. However, there is no evidence suggesting a clinical effect of this phenotype; therefore use as directed and titrate dose in response to efficacy and adverse drug events. On the other hand, the patient may display pharmacoresistance (ABCB1), and thus it may be preferable to use another drug.

Information about interactions:

No interactions of interest with this drug have been detected.

Clomipramine
(Anafranil®)

Analysis result:

- Ultrarapid metabolizer of the drug (*CYP2C19, CYP2D6*).

Interpretation:

The analysis indicates that the patient is a CYP2C19 ultrarapid and a CYP2D6 ultrarapid metabolizer of this drug. Consider an alternative drug not metabolized by this pathway. If this drug is warranted, consider increasing the recommended starting dose.[1] Use therapeutic drug monitoring to guide dose adjustments[3].

Information about interactions:

[Venlafaxine]

⚠ Monitor: Increased risk of QT prolongation, hyponatraemia, serotonin syndrome and other adverse effects (additive effects). Increase medical surveillance and monitor plasma levels of sodium.

Clonazepam
(Klonopin®)

Analysis result:

- The patient carries a variant that has been associated with resistance to antiepileptic drugs in adult patients under polymedication (*ABCB1*).

Interpretation:

Consider starting treatment with standard dose (ABCB1) and, in case of pharmacoresistance, evaluate the need for dose increase or change of drug always at the discretion of the physician.

Information about interactions:

No interactions of interest with this drug have been detected.

Clozapine
(Clozaril®)

Analysis result:

- Ultrarapid metabolizer of the drug (*CYP2D6*).
- Increased risk of metabolic syndrome (*HTR2C*).

Interpretation:

The analysis indicates that the patient is a CYP2D6 ultrarapid metabolizer of this drug. However, there is no evidence suggesting a clinical effect of this phenotype; therefore use as directed and titrate dose in response to efficacy and adverse drug events. Moreover, the analysis indicates that there is an increased risk of metabolic syndrome (HTR2C), and therefore, if applicable, consider selecting an alternative drug or increase medical surveillance.

Information about interactions:

[Caffeine]

Not recommended: Risk of increased plasma levels of Clozapine (inhibited hepatic metabolism). Avoid or reduce caffeine consumption.

[Venlafaxine]

Monitor: Risk of QT prolongation, serotonin syndrome, hyponatraemia and other adverse effects (additive effects). Monitor plasma sodium levels.

Desipramine
(Norpramin®)

Analysis result:

- Ultrarapid metabolizer of the drug (*CYP2D6*).

Interpretation:

The analysis indicates that the patient is a CYP2D6 ultrarapid metabolizer of this drug. Consider an alternative drug not metabolized by this pathway. If this drug is warranted, consider increasing the recommended starting dose.[1] Use therapeutic drug monitoring to guide dose adjustments[3].

Information about interactions:

[Venlafaxine]

Monitor: Increased risk of QT prolongation, hyponatraemia, serotonin syndrome and other adverse effects (additive effects). Increase medical surveillance and monitor plasma levels of sodium.

Desvenlafaxine
(Pristiq®)

Analysis result:

No variations related to response and/or metabolism that are different from the population standard were found in the analyzed genes.

Interpretation:

Use as directed.

Information about interactions:

[Venlafaxine]

Not recommended: Increased risk of serotonin syndrome, hyponatraemia and other adverse effects (additive effects).

Doxepin
(Sinequan®)

Analysis result:

Ultrarapid metabolizer of the drug (*CYP2C19, CYP2D6*).

Interpretation:

The analysis indicates that the patient is a CYP2C19 ultrarapid and a CYP2D6 ultrarapid metabolizer of this drug. Consider an alternative drug not metabolized by this pathway. If this drug is warranted, consider increasing the recommended starting dose.[1] Use therapeutic drug monitoring to guide dose adjustments[3].

Information about interactions:

[Venlafaxine]

⚠ Monitor: Increased risk of QT prolongation, hyponatraemia, serotonin syndrome and other adverse effects (additive effects). Increase medical surveillance and monitor plasma levels of sodium.

Duloxetine
(Cymbalta®)

Analysis result:

Ultrarapid metabolizer of the drug (*CYP2D6*).

Interpretation:

The analysis indicates that the patient is a CYP2D6 ultrarapid metabolizer of this drug. However, there are no clinical data about the effect of this genotype; therefore use as directed and titrate dose in response to efficacy and adverse drug events.

Information about interactions:

[Caffeine]

⚠ Not recommended: Risk of increased plasma levels of Duloxetine (inhibited hepatic metabolism).

[Venlafaxine]

⚠ Not recommended: Increased risk of serotonin syndrome, hyponatraemia and other adverse effects (additive effects).

Escitalopram
(Lexapro®)

Analysis result:

Ultrarapid metabolizer of the drug (*CYP2C19*).

Interpretation:

The analysis indicates that the patient is a CYP2C19 ultrarapid metabolizer of this drug. Consider an alternative drug not predominantly metabolized by this pathway.

Information about interactions:

[Venlafaxine]

⚠ Not recommended: Increased risk of QT prolongation, serotonin syndrome, hyponatraemia and other adverse effects (additive effects).

Eslicarbazepine

Analysis result:

The patient carries a variant that has been associated with resistance to antiepileptic drugs in adult patients under polymedication (*ABCB1*).

Interpretation:

Consider starting treatment with standard dose (ABCB1) and, in case of pharmacoresistance, evaluate the need for dose increase or change of drug always at the discretion of the physician.

Information about interactions:

[Venlafaxine]

⚠ Monitor: Risk of hyponatraemia, among other adverse additive effects. Control sodium plasma levels.

Eszopiclone
(Lunesta®)

Analysis result:

No variations related to response and/or metabolism that are different from the population standard were found in the analyzed genes.

Interpretation:

Use as directed.

Information about interactions:

No interactions of interest with this drug have been detected.

Fluoxetine
(Prozac®)

Analysis result:

Ultrarapid metabolizer of the drug (*CYP2D6*).

Interpretation:

The analysis indicates that the patient is a CYP2D6 ultrarapid metabolizer of this drug. However, there is no evidence suggesting a clinical effect of this phenotype; therefore use as directed and titrate dose in response to efficacy and adverse drug events.

Information about interactions:

[Venlafaxine]

⚠ Not recommended: Risk of increased plasma levels of Venlafaxine, risk of QT prolongation and other adverse effects (inhibited hepatic metabolism). Increased risk of serotonin syndrome, hyponatraemia and other adverse effects (additive effects).

Fluvoxamine
(Luvox®)

Analysis result:

Ultrarapid metabolizer of the drug (*CYP2D6*).

Interpretation:

The analysis indicates that the patient is a CYP2D6 ultrarapid metabolizer of this drug. However, there are no clinical data about the effect of this genotype; therefore use as directed and titrate dose in response to efficacy and adverse drug events.

Information about interactions:

[Venlafaxine]

⚠ Not recommended: Increased risk of serotonin syndrome, hyponatraemia and other adverse effects (additive effects).

[Caffeine]

⚠ Monitor: Risk of increased plasma levels of Caffeine. Decrease the dose of Caffeine or limit its consumption.

Haloperidol
(Haldol®)

Analysis result:

- Ultrarapid metabolizer of the drug (*CYP2D6*).
- High risk of developing extrapyramidal symptoms (*AKT1-DDIT4-FCHSD1-RPTOR*).

Interpretation:

The analysis indicates that the patient has a high risk of developing extrapyramidal symptoms (AKT1-DDIT4-FCHSD1-RPTOR), therefore treatment with a low EPS-risk second generation antipsychotic is recommended. If this drug is warranted, consider the additional use of an anticholinergic. In addition, the analysis indicates that the patient is a CYP2D6 ultrarapid metabolizer of this drug. Adjust maintenance dose in response to haloperidol plasma concentration or select an alternative drug.

Information about interactions:

[Venlafaxine]

⚠ Not recommended: Risk of increased plasma levels of both drugs (inhibited hepatic metabolism). Increased risk of seizures, QT prolongation, serotonin syndrome, hyponatremia and other adverse effects (additive effects).

Iloperidone
(Fanapt®)

Analysis result:

- Ultrarapid metabolizer of the drug (*CYP2D6*).

Interpretation:

The analysis indicates that the patient is a CYP2D6 ultrarapid metabolizer of this drug. However, there is no evidence suggesting a clinical effect of this phenotype; therefore use as directed and titrate dose in response to efficacy and adverse drug events.

Information about interactions:

[Venlafaxine]

⚠ Not recommended: Risk of QT prolongation and serotonin syndrome, among other adverse effects (additive effects).

Imipramine
(Tofranil®)

Analysis result:

- Ultrarapid metabolizer of the drug (*CYP2C19, CYP2D6*).

Interpretation:

The analysis indicates that the patient is a CYP2C19 ultrarapid and a CYP2D6 ultrarapid metabolizer of this drug. Consider an alternative drug not metabolized by this pathway. If this drug is warranted, consider increasing the recommended starting dose.[1] Use therapeutic drug monitoring to guide dose adjustments[3].

Information about interactions:

[Venlafaxine]

⚠ Monitor: Increased risk of QT prolongation, hyponatremia, serotonin syndrome and other adverse effects (additive effects). Increase medical surveillance and control sodium plasma levels.

Lamotrigine
(Lamictal®)

Analysis result:

The patient carries a variant that has been associated with resistance to antiepileptic drugs in adult patients under polymedication (*ABCB1*).

Interpretation:

Consider starting treatment with standard dose (ABCB1) and, in case of pharmacoresistance, evaluate the need for dose increase or change of drug always at the discretion of the physician.

Information about interactions:

No interactions of interest with this drug have been detected.

Levetiracetam

Analysis result:

The patient carries a variant that has been associated with resistance to antiepileptic drugs in adult patients under polymedication (*ABCB1*).

Interpretation:

Consider starting treatment with standard dose (ABCB1) and, in case of pharmacoresistance, evaluate the need for dose increase or change of drug always at the discretion of the physician.

Information about interactions:

No interactions of interest with this drug have been detected.

Lisdexamfetamine

Analysis result:

Ultrarapid metabolizer of the drug (*CYP2D6*).

Interpretation:

The analysis indicates that the patient is a CYP2D6 ultrarapid metabolizer of this drug. However, there is no evidence suggesting a clinical effect of this phenotype; therefore use as directed and titrate dose in response to efficacy and adverse drug events.

Information about interactions:

[Caffeine]

Not recommended: Risk of increased anxiety, irritability, nausea, insomnia or tremors.

[Venlafaxine]

Not recommended: Risk of greater than expected weight loss, safety unknown (additive effects). Risk of serotonin syndrome (additive effects).

[Lamotrigine]

Monitor: Risk of lower seizure threshold. Administer combination with caution in patients on treatment of epilepsy/crisis seizures; consider discontinuing Lisdexamfetamine in the event of seizures.

Lithium
(Eskalith®)

Analysis result:

No variations related to response and/or metabolism that are different from the population standard were found in the analyzed genes.

Interpretation:

Use as directed.

Information about interactions:

[Caffeine]

⚠ Monitor: Risk of reduced plasma levels of Lithium. Monitor plasma levels of Lithium if consumption of Caffeine changes significantly

[Venlafaxine]

⚠ Monitor: Risk of additive serotonergic effects. Monitor the onset of serotonin syndrome symptoms.

Lorazepam
(Ativan®)

Analysis result:

No variations related to response and/or metabolism that are different from the population standard were found in the analyzed genes.

Interpretation:

Use as directed.

Information about interactions:

No interactions of interest with this drug have been detected.

Lurasidone
(Latuda®)

Analysis result:

No variations related to response and/or metabolism that are different from the population standard were found in the analyzed genes.

Interpretation:

Use as directed.

Information about interactions:

No interactions of interest with this drug have been detected.

Methadone

Analysis result:

No variations related to response and/or metabolism that are different from the population standard were found in the analyzed genes.

Interpretation:

Use as directed.

Information about interactions:

[Venlafaxine]

⚠ Not recommended: Increased risk of QT prolongation, serotonin syndrome and other adverse effects (additive effects).

Methylphenidate
(Ritalin®, Concerta®, Metadate®, Daytrana®)

Analysis result:

🟩 Higher likelihood of positive response to treatment (*COMT, LPHN3*).

Interpretation:

The analysis indicates there is a higher likelihood of positive response to treatment (COMT, LPHN3), and therefore, if applicable, use of this drug is recommended in preference to other similar alternatives.

Information about interactions:

[Caffeine]

⚠ Not recommended: The stimulating effects of caffeine may be additives with those of other substances which stimulate the CNS.

[Venlafaxine]
⚠ Not recommended: Risk of greater than expected weight loss.

Mianserin

Analysis result:

Ultrarapid metabolizer of the drug (*CYP2D6*).

Interpretation:

The analysis indicates that the patient is a CYP2D6 ultrarapid metabolizer of this drug. However, there is no evidence suggesting a clinical effect of this phenotype; therefore use as directed and titrate dose in response to efficacy and adverse drug events.

Information about interactions:

No interactions of interest with this drug have been detected.

Mirtazapine
(Remeron®)

Analysis result:

Ultrarapid metabolizer of the drug (*CYP2D6*).

Interpretation:

The analysis indicates that the patient is a CYP2D6 ultrarapid metabolizer of this drug. This phenotype has been associated with increased clearance of the drug. Use as directed and titrate dose in response to efficacy and adverse drug events.

Information about interactions:

[Caffeine]
ⓘ Warning: Risk of increased plasma levels of Mirtazapine (inhibited hepatic metabolism).

Naloxone

Analysis result:

Higher likelihood of positive response to treatment (*OPRM1*).

Interpretation:

The analysis indicates there is a higher likelihood of positive response to treatment (OPRM1), and therefore, if applicable, use of this drug is recommended in preference to other similar alternatives.

Information about interactions:

No interactions of interest with this drug have been detected.

Naltrexone

Analysis result:

Higher likelihood of positive response to treatment (*OPRM1*).

Interpretation:

The analysis indicates there is a higher likelihood of positive response to treatment (OPRM1), and therefore, if applicable, use of this drug is recommended in preference to other similar alternatives.

Information about interactions:

No interactions of interest with this drug have been detected.

Nortriptyline
(Pamelor®)

Analysis result:

Ultrarapid metabolizer of the drug (*CYP2D6*).

Interpretation:

The analysis indicates that the patient is a CYP2D6 ultrarapid metabolizer of this drug. Consider an alternative drug not metabolized by this pathway. If this drug is warranted, consider increasing the recommended starting dose.[1] Use therapeutic drug monitoring to guide dose adjustments[3].

Information about interactions:

[Venlafaxine]

⚠ Monitor: Increased risk of QT prolongation, hyponatremia, serotonin syndrome and other adverse effects (additive effects). Increase medical surveillance and control sodium plasma levels.

Olanzapine
(Zyprexa®)

Analysis result:

Ultrarapid metabolizer of the drug (*CYP1A2*).

Increased risk of metabolic syndrome (*HTR2C*).

Interpretation:

The analysis suggests that the patient metabolizes the drug faster than average (CYP1A2), and therefore a higher dose than standard is recommended. However, the analysis indicates that there is an increased risk of metabolic syndrome (HTR2C), and therefore, if applicable, consider selecting an alternative drug or increase medical surveillance.

Information about interactions:

No interactions of interest with this drug have been detected.

Oxcarbazepine
(Trileptal®)

Analysis result:

The patient carries a variant that has been associated with resistance to antiepileptic drugs in adult patients under polymedication (*ABCB1*).

Interpretation:

Consider starting treatment with standard dose (ABCB1) and, in case of pharmacoresistance, evaluate the need for dose increase or change of drug always at the discretion of the physician.

Information about interactions:

[Venlafaxine]

⚠ Monitor: Risk of serotonin syndrome, hyponatraemia and other adverse effects. Monitor plasma levels of sodium.

Paliperidone
(Invega®)

Analysis result:

High risk of developing extrapyramidal symptoms (*AKT1-DDIT4-FCHSD1-RPTOR*).

Increased risk of metabolic syndrome (*HTR2C*).

Interpretation:

The analysis indicates that the patient has a high risk of developing extrapyramidal symptoms (AKT1-DDIT4-FCHSD1-RPTOR), therefore treatment with a low EPS-risk second generation antipsychotic is recommended. If this drug is warranted, consider the additional use of an anticholinergic. Moreover, the analysis indicates that there is an increased risk of metabolic syndrome (HTR2C), and therefore, if applicable, consider selecting an alternative drug or increase medical surveillance.

Information about interactions:

[Venlafaxine]

⚠ Not recommended: Risk of QT prolongation, serotonin syndrome and other adverse effects (additive effects).

Paroxetine
(Paxil®)

Analysis result:

Ultrarapid metabolizer of the drug (*CYP2D6*).

Interpretation:

The analysis indicates that the patient is a CYP2D6 ultrarapid metabolizer of this drug. Select an alternative drug not predominantly metabolized by this pathway.

Information about interactions:

[Venlafaxine]

⚠ Not recommended: Increased risk of serotonin syndrome, hyponatraemia and other adverse effects (additive effects).

Perphenazine
(Trilafon®)

Analysis result:

Ultrarapid metabolizer of the drug (*CYP2D6*).

Interpretation:

The analysis indicates that the patient is a CYP2D6 ultrarapid metabolizer of this drug. However, there is no evidence suggesting a clinical effect of this phenotype; therefore use as directed and titrate dose in response to efficacy and adverse drug events.

Information about interactions:

[Venlafaxine]

⚠ Monitor: Risk of hyponatraemia, QT prolongation, serotonin syndrome and other adverse effects (additive effects). Monitor plasma levels of sodium.

Phenobarbital

Analysis result:

The patient carries a variant that has been associated with resistance to antiepileptic drugs in adult patients under polymedication (*ABCB1*).

Interpretation:

Consider starting treatment with standard dose (ABCB1) and, in case of pharmacoresistance, evaluate the need for dose increase or change of drug always at the discretion of the physician.

Information about interactions:

[Lamotrigine]

↑ Monitor: Risk of reduced plasma levels of Lamotrigine; increase the dosage of Lamotrigine (see extended information for specific dose recommendations).

Phenytoin

Analysis result:

The patient carries a variant that has been associated with resistance to antiepileptic drugs in adult patients under polymedication (*ABCB1*).

Interpretation:

Consider starting treatment with standard dose (ABCB1) and, in case of pharmacoresistance, evaluate the need for dose increase or change of drug always at the discretion of the physician.

Information about interactions:

[Lamotrigine]

Monitor: Risk of reduced plasma levels of Lamotrigine, increase dose (see additional information for specific dose recommendation).

[Caffeine]

Warning: Risk of reduced plasma levels of Caffeine (induced hepatic metabolism).

Pimozide

Analysis result:

Ultrarapid metabolizer of the drug (*CYP2D6*).

Interpretation:

The analysis indicates that the patient is a CYP2D6 ultrarapid metabolizer of this drug. However, there is no evidence suggesting a clinical effect of this phenotype; therefore use as directed and titrate dose in response to efficacy and adverse drug events.

Information about interactions:

[Venlafaxine]

Not recommended: Risk of QT prolongation and arrhythmias (additive effects).

Quetiapine

(Seroquel®)

Analysis result:

No variations related to response and/or metabolism that are different from the population standard were found in the analyzed genes.

Interpretation:

Use as directed.

Information about interactions:

No interactions of interest with this drug have been detected.

Risperidone

(Risperdal®)

Analysis result:

Ultrarapid metabolizer of the drug (*CYP2D6*).

High risk of developing extrapyramidal symptoms (*AKT1-DDIT4-FCHSD1-RPTOR*).

Increased risk of metabolic syndrome (*HTR2C*).

Interpretation:

The analysis indicates that the patient has a high risk of developing extrapyramidal symptoms (AKT1-DDIT4-FCHSD1-RPTOR), therefore treatment with a low EPS-risk second generation antipsychotic is recommended. If this drug is warranted, consider the additional use of an anticholinergic. Moreover, the analysis indicates that there is an increased risk of metabolic syndrome (HTR2C), and therefore, if applicable, consider selecting an alternative drug or increase medical surveillance. In addition, the analysis indicates that the patient is a CYP2D6 ultrarapid metabolizer of this drug. Select an alternative drug or be extra alert to decreased efficacy and titrate dose in response to clinical effect.

Information about interactions:

No interactions of interest with this drug have been detected.

Sertraline
(Zoloft®)

Analysis result:

Ultrarapid metabolizer of the drug (*CYP2C19*).

Interpretation:

The analysis indicates that the patient is a CYP2C19 ultrarapid metabolizer of this drug. Use as directed and in the event of non-response consider an alternative drug not predominantly metabolized by this pathway.

Information about interactions:

[Venlafaxine]

⚠ Not recommended: Increased risk of serotonin syndrome, hyponatraemia and other adverse effects (additive effects).

Thioridazine
(Mellaril®)

Analysis result:

Ultrarapid metabolizer of the drug (*CYP2D6*).

Interpretation:

The analysis indicates that the patient is a CYP2D6 ultrarapid metabolizer of this drug. However, there is no evidence suggesting a clinical effect of this phenotype; therefore use as directed and titrate dose in response to efficacy and adverse drug events.

Information about interactions:

[Venlafaxine]

⊗ Contraindication: Risk of cardiac arrhythmias and other adverse effects.

Topiramate
(Topamax®)

Analysis result:

The patient carries a variant that has been associated with resistance to antiepileptic drugs in adult patients under polymedication (*ABCB1*).

Interpretation:

Consider starting treatment with standard dose (ABCB1) and, in case of pharmacoresistance, evaluate the need for dose increase or change of drug always at the discretion of the physician.

Information about interactions:

No interactions of interest with this drug have been detected.

Trazodone
(Desyrel®)

Analysis result:

No variations related to response and/or metabolism that are different from the population standard were found in the analyzed genes.

Interpretation:

Use as directed.

Information about interactions:

[Venlafaxine]

⚠ Monitor: Increased risk of serotonin syndrome, CNS depression, hyponatremia and other adverse effects (additive effects). Increase medical surveillance, and monitor sodium plasma levels.

Trimipramine

Analysis result:

Ultrarapid metabolizer of the drug (*CYP2C19, CYP2D6*).

Interpretation:

The analysis indicates that the patient is a CYP2C19 ultrarapid and a CYP2D6 ultrarapid metabolizer of this drug. Consider an alternative drug not metabolized by this pathway. If this drug is warranted, consider increasing the recommended starting dose.[1] Use therapeutic drug monitoring to guide dose adjustments[3].

Information about interactions:

[Venlafaxine]

⚠ Monitor: Increased risk of QT prolongation, hyponatremia, serotonin syndrome and other adverse effects (additive effects). Increase medical surveillance and control sodium plasma levels.

Valproic Acid

(Depakote®)

Analysis result:

The patient carries a variant that has been associated with resistance to antiepileptic drugs in adult patients under polymedication (*ABCB1*).

Interpretation:

Consider starting treatment with standard dose (ABCB1) and, in case of pharmacoresistance, evaluate the need for dose increase or change of drug always at the discretion of the physician.

Information about interactions:

[Lamotrigine]

⚠ Monitor: Risk of decreased plasma levels of Valproic Acid; monitor plasma levels of Valproic Acid. Risk of increase of those of Lamotrigine; decrease the dosage of Lamotrigine (see additional information for specific dosage recommendation).

[Venlafaxine]

⚠ Monitor: Increased risk of hyponatraemia and other adverse effects (additive effects). Control sodium plasma levels.

Venlafaxine

(Effexor®)

Analysis result:

Ultrarapid metabolizer of the drug (*CYP2D6*).

Interpretation:

The analysis indicates that the patient is a CYP2D6 ultrarapid metabolizer of this drug. Select an alternative drug or titrate dose to a maximum of 150% of the normal dose in response to efficacy and adverse drug events.

Information about interactions:

No interactions of interest with this drug have been detected.

Vigabatrin

Analysis result:

The patient carries a variant that has been associated with resistance to antiepileptic drugs in adult patients under polymedication (*ABCB1*).

Interpretation:

Consider starting treatment with standard dose (ABCB1) and, in case of pharmacoresistance, evaluate the need for dose increase or change of drug always at the discretion of the physician.

Information about interactions:

No interactions of interest with this drug have been detected.

Vortioxetine
(Trintellix®)

Analysis result:

Ultrarapid metabolizer of the drug (*CYP2D6*).

Interpretation:

The analysis indicates that the patient is a CYP2D6 ultrarapid metabolizer of this drug. However, there is no evidence suggesting a clinical effect of this genotype; therefore use as directed and titrate dose in response to efficacy and adverse drug events.

Information about interactions:

[Venlafaxine]

⚠ Not recommended: Increased risk of serotonin syndrome, hyponatraemia and other adverse effects (additive effects).

Zolpidem
(Ambien®)

Analysis result:

No variations related to response and/or metabolism that are different from the population standard were found in the analyzed genes.

Interpretation:

Use as directed.

Information about interactions:

No interactions of interest with this drug have been detected.

Zonisamide

Analysis result:

Ultrarapid metabolizer of the drug (*CYP2C19*).

Interpretation:

The analysis indicates that the patient is a CYP2C19 ultrarapid metabolizer of this drug. However, there is no evidence suggesting a clinical effect of this phenotype; therefore use as directed and titrate dose in response to efficacy and adverse drug events.

Information about interactions:

No interactions of interest with this drug have been detected.

Zuclopenthixol

Analysis result:

- Ultrarapid metabolizer of the drug (*CYP2D6*).
- High risk of developing extrapyramidal symptoms (*AKT1-DDIT4-FCHSD1-RPTOR*).

Interpretation:

The analysis indicates that the patient has a high risk of developing extrapyramidal symptoms (AKT1-DDIT4-FCHSD1-RPTOR), therefore treatment with a low EPS-risk second generation antipsychotic is recommended. If this drug is warranted, consider the additional use of an anticholinergic. In addition, the analysis indicates that the patient is a CYP2D6 ultrarapid metabolizer of this drug. Be alert to low zuclopenthixol plasma levels or select alternative drug.

Information about interactions:

No interactions of interest with this drug have been detected.

The following clarifications apply only to tricyclic antidepressants, provided that they are referenced in the text of the recommendation:

(1) Patients may receive a low TCA starting dose, which will be increased over a number of days until the recommended steady-state dose has been reached. The starting dose in these guidelines refers to the recommended steady-state dose.

(3) Dosage recommendations apply to high starting doses, used in the treatment of conditions such as depression. For conditions in which this drug is used in lower doses, like neuropathic pain, there is also a risk of inefficacy for ultrarapid metabolizers; alternative agents should therefore also be considered.

Folic Acid Conversion

GENE	RESULT AND INTERPRETATION

MTHFR

Analysis result:

Slightly reduced MTHFR enzyme activity.

Interpretation:

The patient carries the T allele of the *MTHFR* C677T polymorphism in heterozygosis. This genotype has been associated with slightly reduced MTHFR enzyme activity, slightly reduced serum folate levels, and slightly elevated serum levels of homocysteine. Folic acid or L-methylfolate may be used for folate supplementation if clinically indicated.

Test information

Genotyping of single nucleotide polymorphisms (SNPs) included in the Neuropharmagen® genetic analysis was performed by OpenArray® Technology (Thermo Fisher Scientific). Analysis of *SLC6A4* was performed by polymerase chain reaction (PCR) followed by capillary electrophoresis of PCR products. *CYP2D6* copy number analysis was performed using real-time PCR. The following genetic variants may be detected in this assay: *ABCB1* NG_011513.1:g.186045A>G, NG_011513.1:g.209054C>T, *AL157359* NC_000021.9:g.18955109T>G, NC_000021.8:g.20312612T>C, *BDNF* p.Val66Met (NM_170735.5:c.196G>A), *CES1* p.Gly143Glu (NM_001025194.1:c.428G>A), *COMT* p.Val158Met (NM_000754.3:c.472G>A), *CYP1A2* -163C>A (NG_008431.2:g.32035C>A), *CYP2B6* *1, *6 (NG_007929.1:g.20638G>T), *CYP2C19* *1, *2 (NM_000769.3:c.681G>A), *3 (NM_000769.3:c.636G>A), *4 (NM_000769.3:c.1A>G), *5 (NM_000769.3:c.1297C>T), *6 (NM_000769.3:c.395G>A), *7 (NM_000769.1:c.819+2T>A), *8 (NM_000769.3:c.358T>C), *9 (NM_000769.3:c.431G>A), *10 (NM_000769.3:c.680C>T), *17 (NM_000769.2:c.-806C>A), *27 (NM_000769.2:c.-1041A>G); *CYP2C9* *1, *2 (NM_000771.3:c.430C>T), *3 (NM_000771.3:c.1075A>C), *5 (NM_000771.3:c.1080C>G), *6 (NM_000771.3:c.818delA), *8 (NM_000771.3:c.449G>A), *11 (NM_000771.3:c.1003C>T), *27 (NM_000771.3:c.449G>T), *CYP2D6* *1, *2 (NM_000106.5:c.886C>T; c.1457G>C), *3 (NM_000106.5:c.775delA), *4 (NM_000106.5:c.506-1G>A; c.100C>T; c.1457G>C), *5 (gene deletion), *6 (NM_000106.5:c.454delT), *7 (NM_000106.5:c.971A>C), *8 (NM_000106.5:c.505G>T), *9 (NM_000106.5:c.841_843delAAG), *10 (NM_000106.5: c.100C>T; c.1457G>C), *11 (NM_000106.5:c.181-1G>C), *12 (NM_000106.5:c.124G>A), *14 (NM_000106.5:c.505G>A), *15 (NM_000106.5:c.137dup), *17 (NM_000106.5:c.320C>T), *19 (NM_000106.5:c.765_768delAACT), *29 (NM_000106.5:c.1012G>A), *34, *35 (NM_000106.5:c.31G>A; c.886C>T; c.1457G>C; NG_008376.3:g.2617C>G), *36, *36-*10, *39, *40, *41 (NM_000106.5:c.985+39G>A; c.886C>T; c.1457G>C), *69 (NM_000106.5: c.100C>T; c.985+39G>A; c.886C>T; c.1457G>C), gene duplication and multiplication, *CYP3A4* *1, *22 (NM_017460.5:c.522-191C>T), *DDIT4* (NM_019058.3:c.*95T>A), *EPHX1* p.Tyr113His (NM_000120.3:c.337T>C), *FCHSD1* (NM_033449.2:c.1311+176C>A), *GRIK2* (NG_009224.2:g.64748A>C), *GRIK4* (NG_042194.1:g.285909T>C), *HLA-A* (NG_029217.2:g.8057A>T), *HTR2A* c.-1438G>A (NM_000621.4:c.-998G>A), NG_013011.1:g.42815G>C, *HTR2C* NG_012082.2:g.324497C>G), *LPHN3/ADGRL3* (NG_033950.2:g.677568G>A), *OPRM1* p.Asn40Asp (NM_001008504.3:c.118A>G), *RPTOR* (NG_013034.1:g.175279A>G), *SLC6A4* 5HTTLPR, *UGT2B15* *1, *2 (NM_001076.3:c.253T>G).

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Report generation date: 07/18/2023

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