Genetic and Genomic Testing Pipeline

Melbourne Genomics Health Alliance

Global knowledge. Individual care.

Pre-test

Identify patient

Genetic and genomic testing can help provide a definite diagnosis for many patients. For others, it can inform treatment or management.

Choose appropriate test

There are a range of genetic and genomics tests. The right test depends on the type of genetic variant you are trying to find. Tests also vary in terms of cost, turn-around time and complexity of interpretation.

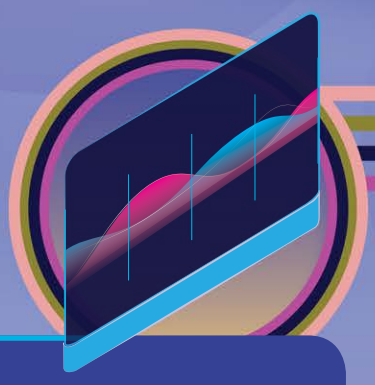
Pre-test counselling and informed consent

Genetic and genomic testing can generate uncertain or unanticipated information; therefore, informed consent is essential.

yes

no

Test



Single gene
Microarray
NGS / Panel
Exome sequencing
Genome sequencing

Amount of genome sequenced

Single gene	~98%
Microarray	~2%
NGS / Panel	<2%
Exome sequencing	*
Genome sequencing	<2%

*Microarrays (CMAs) do not use sequencing technology so are not included here.

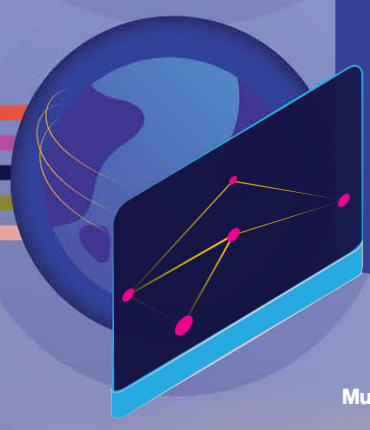
Amount of clinical information required to support testing and interpreting results

Sequencing

Next generation sequencing (NGS) determines the order of nucleotides in a group of targeted genes (a gene panel), whole exome (all coding regions of the genome) or whole genome (all nuclear and mitochondrial DNA).

Analysis (Bioinformatics)

DNA sequence data is analysed through a 'pipeline', a series of algorithms and statistical steps to check sequence quality, assemble data and compare to a reference.

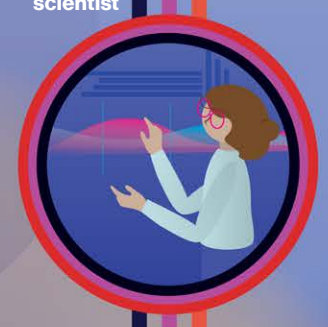


Variant identification and interpretation

Comparison of patient and reference DNA sequences reveals sites of variation. 'Variants' in genes relevant to the patient phenotype are prioritised for analysis (curation) and classification, with evidence sourced from international databases, from benign to pathogenic.

Multidisciplinary team
Team may include medical scientists, clinical geneticists, genetic counsellors and, ideally, the referring medical specialist.

Medical scientist



Post-test

Rapid	3 - 6 months (standard)
Ultra rapid	3 - 6 months (standard)
Exome sequencing	Approx. 12 weeks
Genome sequencing	1 - 2 weeks
Gene panel	2 - 3 weeks

Average time taken to generate test results report

1 week (Rapid), 3 days (Ultra rapid).

Case review

Variant classification is reviewed against the clinical information and patient phenotype. Variants that may explain the phenotype and clinical features are reported.

Interpret and provide results

The laboratory will provide a report of results. Genetic or medical specialists will interpret these and discuss in the clinical setting with the patient.

Post-test counselling

It is important for patients to understand all aspects of the test results, including uninformative or uncertain results, and potential implications for clinical management or other family members.

Ongoing management: Genomic testing may or may not affect management or treatment options.

Further testing

Genomic testing results may lead to testing of family members and/or prenatal testing for future pregnancies. Further testing may be required to better understand variants identified (e.g. segregation testing). Future reanalysis of sequence data may also be an option (e.g. as new genes are discovered).