Cancer Genomics Service

Outpatient Oncology Nurses Information

What is the new service?

The new service is comprehensive genetic sequencing for oncology patients. Cancer is caused by genetic mutations. Sometimes, a mutation is inherited which increases a person's susceptibility to cancer. However, in the majority of cases, it arises by chance in the process of copying DNA when cells copy and divide. If this mutation is in a gene which affects cell growth or repair, then many additional mutations are accumulated in that cell, and all the cells subsequently derived from that cell. These genetic mutations which were not inherited but occurred in a subset of cells over time are known as **somatic mutations**. Some of these mutations can result in cells either becoming immortal or having a growth advantage over normal cells, giving rise to cancer. Such mutations are said to be **"driving"** the cancer.

This new service identifies and reports mutations in commonly mutated genes using **whole-exome sequencing (WES)**. A gene is made up of different segments of DNA called exons and introns. Only the exons code for a protein, and most mutations which affect protein production occur within the exons. The DNA in the exons (**exome**) comprises approximately 1.5% of total DNA (**genome**) in a cell. Exome sequencing will be performed on the tumour cells and also unaffected cells (**germline** sample). Then all the mutations in the germline sample are subtracted from all the mutations seen in the tumour sample, resulting in a list of somatic mutations only. These mutations will then be compared to databases to determine whether they are **clinically actionable** i.e. whether they inform the diagnosis, prognosis or management of the patient.

Who is providing this service?

A new, state-of-the-art, cancer genomics service was made available for cancer patients within Metro South HHS in January 2017. This service is a partnership between Metro South HHS, the QUT Australian Translational Genomics Centre (ATGC) and Pathology Queensland.

Why is the service being offered?

⇒ Improve Clinical care

- ⇒ Improve accuracy of diagnosis of cancer type
- ⇒ Aid in the determination of prognosis
- ⇒ Aid in the selection of treatment by the identification of drug targets

⇒ Facilitate Research and Development (if patients consent to research)

- ⇒ Identification of new cancer-causing genes
- ⇒ Aid in the understanding of cancer biology
- ⇒ Aid in the development of new treatments

Where the treating physicians identifies clinical benefit, the WES test will be ordered on Cerner

ieMR and performed by ATGC.

Which cancer patients will be offered the service?

Current cancers sequenced regularly by ATGC include blood, lung, breast, gastrointestinal, renal, skin, and colorectal cancers. This list may expand to include additional cancers over time.

What are the logistics?

Samples

For this test, we need two types of samples, a tumour/affected tissue sample and a normal/unaffected germline sample.

	Affected Sample (Tumour)	Unaffected Sample (Germline / Normal)
Blood Cancers	Bone Marrow [Test code WES]	Hair collected in Day Care Centre on day of BMA (requirements on sample pot). [Test Code GERML]
Solid Cancers	Tumour sample collected in theatre in RNA Later Sample pot and sent to Anatomical Pathology. [Test code WES]	Blood – 1 x Purple Top EDTA Blood Tube collected by Pathology Queensland. [Test Code GERML]

Bone Marrow and Hair samples should be sent to the Special Investigations Unit.

All other samples should be sent to Anatomical Pathology (e.g. with histology samples), or can be sent to CSR (Central Specimen Reception). These locations will notify ATGC staff when samples are ready for collection.

Consent forms can accompany the sample bags or, if needed, ATGC staff can be contacted to collect them from the appropriate ward or unit.

All samples will be sent to the ATGC, a NATA-accredited laboratory located on Level 2 of R-Wing, where DNA will be extracted and sequenced.

If there are questions about sample type/amount, please contact the ATGC laboratory on 3443 7280, or email atglab@qut.edu.au (Lisa Anderson is Lab Manager). These details are on each sample pot and sample pack bag.

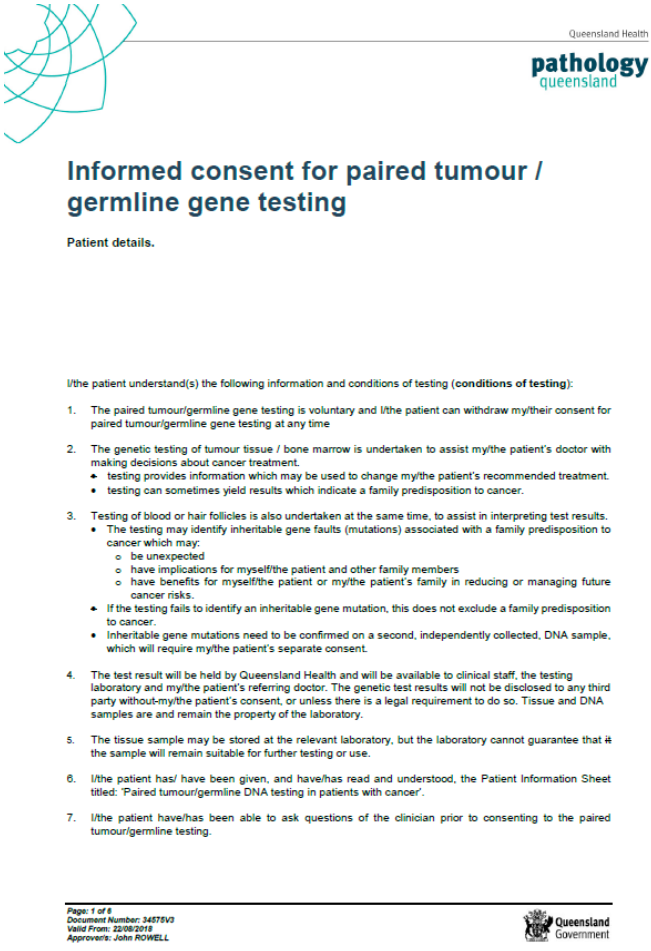
Test Requests

Test requests should be entered in iEMR. Two separate request codes must be used for the two samples:

- Use Test Code **WES** for the **Tumour/affected tissue**
- Use Test Code **GERML** for the **Normal/unaffected tissue**. No billing is generated from the GERML test code, and this test code does not appear on incomplete test list.

Consents

The patient must give consent by signing the Pathology Queensland Genetic Testing request form.



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Informed consent for paired tumour / germline gene testing

Patient details.

I/the patient understand(s) the following information and conditions of testing (**conditions of testing**):

1. The paired tumour/germline gene testing is voluntary and I/the patient can withdraw my/their consent for paired tumour/germline gene testing at any time
2. The genetic testing of tumour tissue / bone marrow is undertaken to assist my/the patient's doctor with making decisions about cancer treatment.
   - testing provides information which may be used to change my/the patient's recommended treatment.
   - testing can sometimes yield results which indicate a family predisposition to cancer.
3. Testing of blood or hair follicles is also undertaken at the same time, to assist in interpreting test results.
   - The testing may identify inheritable gene faults (mutations) associated with a family predisposition to cancer which may:
     - be unexpected
     - have implications for myself/the patient and other family members
     - have benefits for myself/the patient or my/the patient's family in reducing or managing future cancer risks.
   - If the testing fails to identify an inheritable gene mutation, this does not exclude a family predisposition to cancer.
   - Inheritable gene mutations need to be confirmed on a second, independently collected, DNA sample, which will require my/the patient's separate consent.
4. The test result will be held by Queensland Health and will be available to clinical staff, the testing laboratory and my/the patient's referring doctor. The genetic test results will not be disclosed to any third party without my/the patient's consent, or unless there is a legal requirement to do so. Tissue and DNA samples are and remain the property of the laboratory.
5. The tissue sample may be stored at the relevant laboratory, but the laboratory cannot guarantee that ~~it~~ the sample will remain suitable for further testing or use.
6. I/the patient has/ have been given, and have/has read and understood, the Patient Information Sheet titled: 'Paired tumour/germline DNA testing in patients with cancer'.
7. I/the patient have/has been able to ask questions of the clinician prior to consenting to the paired tumour/germline testing.

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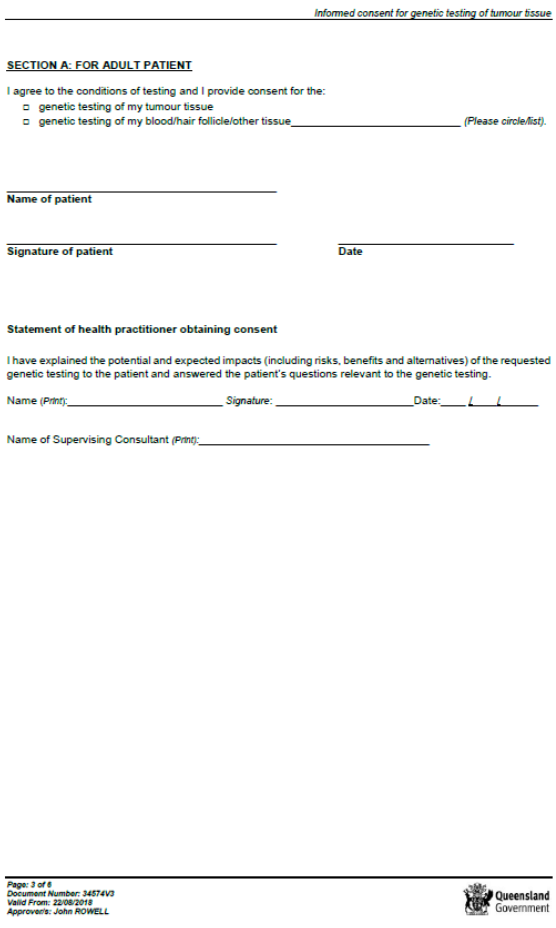

Informed consent for genetic testing of tumour tissue

SECTION A: FOR ADULT PATIENT

I agree to the conditions of testing and I provide consent for the:

- ☐ genetic testing of my tumour tissue
- ☐ genetic testing of my blood/hair follicle/other tissue_____ *(Please circle/list).*

_____
Name of patient

_____ _____
Signature of patient **Date**

Statement of health practitioner obtaining consent

I have explained the potential and expected impacts (including risks, benefits and alternatives) of the requested genetic testing to the patient and answered the patient's questions relevant to the genetic testing.

Name *(Print)*:_____ *Signature*: _____Date:___/___/_____

Name of Supervising Consultant *(Print)*:_____

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Consent is obtained by the caring physician or a member of the clinical staff, typically in Outpatients clinic, although it may also be in the Emergency Department. This session will include the following key points:

- The test is focused on detecting new mutations which started for the first time in the tumour.
- These mutations could give information about the diagnosis, the prognosis or treatment.

However, it does not always result in clinically actionable information. Patients need to be prepared for that possibility.

- From mid to late 2019, clinical testing will also include evaluating selected germline (inherited) mutations to determine whether that patient may have developed that cancer because they inherited a mutation which put them at increased risk. **There is 3-5% chance that this test could reveal that this cancer was caused by an inherited mutation.** If that were the case, it may have implications for:
    - Treatment and management of the current cancer
    - Future surveillance, screening and risk-reducing interventions for the patient.
    - Other family members. If such a mutation was identified, then they would be referred to Genetic Health Queensland to discuss it further.

Consent forms should be scanned into iEMR. The ATGC laboratory need to receive a copy of this consent.

If there are questions during consent, please contact Genetic Health Queensland's on-call genetic counsellor on (07) 3646 1686.

Blank consent forms and additional information are available on ATGC website: https://research.qut.edu.au/translationalgenomicsgroup/resources/