



THEME

Genetics in
general practice



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Family genetics

BACKGROUND

A comprehensive family history, regularly updated and including the patient's ancestry and cultural background can aid in diagnosis, risk prediction, referral and genetic testing.

OBJECTIVE

This article discusses the professional and support services available to families following the identification of a genetic condition or mutated gene, conferring individual or reproductive risk.

DISCUSSION

Genetic testing for a range of conditions is available for diagnostic, carrier, predictive and presymptomatic purposes. Genetic testing for ancestry promoted widely on the internet has little or no scientific validity. Patients should be strongly encouraged to share their genetic information to enable cascade genetic testing. Genetics services provide current information, and where appropriate, discussion of reproductive options and genetic testing after consideration of all the implications and support for the decision making and its consequences engendered. Support groups for specific conditions are important partners in the provision of support for families with genetic conditions.

The shared nature of genetic information within families means that the diagnosis of a genetic condition or an inherited susceptibility in a family member has implications for all blood relatives. The increasing ability to analyse this genetic information creates challenges and opportunities for doctors to provide medical and psychosocial benefit to both patients and their families.^{1,2} In this article, we consider key practice issues relating to families and genetic health in an Australian context. The article is based on *Genetics in family medicine: the Australian handbook for general practitioners*.³

Family history

As discussed in the article by Emery et al this issue, genetic medicine can play a role in preventive health care for an increasing number of chronic conditions. Underpinning many applications of genetic medicine is the concept that evidence obtained from the analysis of a comprehensive family history that a genetic condition or mutated gene could cause the condition and can assist in preventive health care.

In taking the family history, collect information (where possible) on three generations on both sides of the family, regardless of the condition(s). Note as appropriate:

- age
- age at diagnosis of affected family members(s)
- age and cause of death
- birth defects

- family relationships (including same sex and step relationships, adoption)
- stillbirths, miscarriages, terminations of pregnancy, and
- children born of parents who are relatives.⁴

Geonograms can be a useful tool in recording and updating family history. Additionally, it is important to note the patient's ancestry and cultural background.

Although the family history may have been documented at the first visit, family history evolves and new information should be gathered opportunistically, and the date(s) of updates noted. The patient should understand the reason for collecting this information, as some of it may be private, and may not be known by other members of the family. Current privacy legislation allows health information to be collected from an individual about another individual in certain circumstances including family history taking.⁵

The accuracy of a medical family history will be dependent on both the patient's recollection and the condition. For example, breast and colorectal cancer among families is often more accurately reported than uterine cancer.⁶ You may wish to give your patient a family history questionnaire so that more accurate information can be gathered (see *Resources*).

Lay beliefs, ethnicity and culture

In the clinical setting, the scientific and medical aspects of genetic conditions intersect with commonly held beliefs

Table 1. Genetic carrier screening based on ethnic and cultural background

Ethnic or cultural background	Condition and inheritance pattern of the mutated gene	Carrier frequency
Ashkenazi Jewish (central and northern European Jewish)	Tay-Sachs disease (hexosaminidase deficiency), AR	1 in 25
	Cystic fibrosis, AR	1 in 25
	Familial dysautonomia (IB kinase complex associated protein family deficiency), AR	1 in 30
	Canavan disease, AR	1 in 40
	Fanconi anaemia, AR	1 in 100
	Familial breast and ovarian cancer predisposition, AD	1 in 40
Northern European (includes UK)	Cystic fibrosis, AR	1 in 25
	Hereditary haemochromatosis, AR	1 in 8
Middle Eastern, Mediterranean, African, Southeast Asian, African, New Guinean	Glucose-6-phosphate dehydrogenase deficiency, AR	1 in 20 to 1 in 4
Middle Eastern, southern European, Indian subcontinent, central and Southeast Asian, African	β -thalassaemia, AR	1 in 5 to 1 in 12
Chinese, Southeast Asian, southern European, Middle Eastern, Indian subcontinent, Pakistani, African, the Pacific Islander, Maori	α -thalassaemia, AR	~1 in 20
Lebanese (Christian), Dutch descent (cf Afrikaans), French Canadian	Familial hypercholesterolaemia, AD	1 in 70

AR = autosomal recessive, AD = autosomal dominant, XLR = X-linked recessive

about inheritance and relationships. Lay beliefs can differ about concepts of family and kinship, the causation of a condition in a family and perceptions of risk.⁷⁸ Exploration of a patient's pre-existing beliefs can be useful, as these beliefs may negate understanding or acceptance of the concepts of genetics.⁹ Acknowledging the importance of these beliefs to the patient, rather than dismissing them, may also help maintain the patient-doctor relationship. Some lay beliefs are influenced by the person's cultural or ethnic background.

While familiarisation with common cultural beliefs can assist in the communication process, care should be taken to avoid stereotyping. There is often as great a diversity of belief within a single group as there is between cultures and practices relatively common within one culture, such as consanguinity, are not confined to members of that group.

Not all cultures follow the Anglo-Celtic concept of bilateral descent. For example, for families with an Indigenous Australian or Torres Strait background, the concept of family history may hold a different meaning. When collecting a family history or drawing a genogram for these peoples, consider issues pertaining to the 'lost and stolen generation'. In some cases, the historical background will mean that family history is unclear or unattainable. In some cases, deceased relatives may not be named. Kinship patterns within families also require

special attention as people considered relatives may not be biological relations; intra- and inter-familial adoptions should also be considered. Consultation with an Aboriginal liaison officer (based in state hospitals or public health units) is recommended.

Communication should be individualised: options discussed should not be limited or based on choices anticipated due to ethnicity, culture or religion.⁹ Communication and cultural understanding can be facilitated by the use, whenever possible, of medically trained interpreters. Use of a family member should be avoided as it can be particularly problematic when discussing genetic issues. Generally, people resident in an English speaking country for less than 2 years will require an interpreter. However, it is worth remembering that language skills can be affected by distress and emotional situations. An interpreting service may be helpful (see *Resources*). Ethnic agencies can help provide insight into common cultural beliefs, multilingual education material and information about services.

Ancestry and genetic testing

When ordering carrier genetic testing, it is important to note the patient's ancestry as it may guide the panel of some mutations used in the screening. For example,

mutations causing cystic fibrosis in Ashkenazi Jews differ from those found in people with northern European ancestry. Nevertheless, while carrier tests for specific mutations more common in some ethnic and cultural groups are available (*Table 1*), the presence of such a mutation does not necessarily reflect cultural identification. For example, the presence of a mutation that is more common in the Jewish community, does not mean that individual identifies with Jewish culture.

A distinction must be made between testing for mutations more commonly found in some ethnic and cultural groups and 'ancestry genetic testing', widely promoted through the internet, that claims to identify a person's racial ancestry. Findings from the Human Genome Project have confirmed that there is no genetic basis for race: there is little to no scientific evidence of validity for 'ancestry testing'.¹⁰

There is no genetic test for Aboriginality, for example. Other forms of identification of membership of a group may be available including oral history, written documentation, cultural practices and personal beliefs. Even in their absence, the evidence for what constitutes family and kinship in the Aboriginal context is much broader than genetic markers can establish.

Genetic testing

There are a number of different forms of genetic testing, with different eligibility criteria and consequences (*Table 2*). In essence, the identification of a gene mutation in an individual may:

- confirm the diagnosis of a genetic condition (mutation detection) or
- identify a susceptibility to develop a condition later in

life (predictive or presymptomatic testing), or

- indicate that while there are no signs or symptoms of the condition, there may be an increased risk of having a child with a genetic condition (carrier testing).

When a mutation is identified in a family, cascade testing may be available to identify other members of the family with the same mutation.

Referral to genetics services

A list of common contexts for referral to genetics services is provided in *Table 3*.¹¹ A genetics team can assist patients in understanding:

- the condition
- the risks, if any, to themselves
- the chances of having an affected child
- the availability of reproductive options (if relevant), and
- genetic testing, where available and/or possible.

In professional genetic counselling, the implications of knowing more about genetic information is discussed, including medical, psychological and reproductive aspects, and issues concerning employment or insurance and the privacy and confidentiality of genetic information.¹²

The availability (or otherwise) of genetic testing and its implications are usually a key aspect of a genetics consultation (*Table 1, 2*). The complexity of services provided by a genetics team requires a multidisciplinary approach that includes clinical geneticists, genetic counsellors, social workers, related medical specialists in areas such as prenatal diagnosis, familial cancers and neurology, scientists and pathologists working in diagnostic laboratory services (see *Resources*).

Table 2. Testing for genetic conditions

Carrier screening based on ancestry

Screening to determine carrier status for genetic conditions common in certain populations may be available on ancestry alone. The autosomal recessive pattern of inheritance means that carrier screening should not be restricted to those with a positive family history. When ordering carrier genetic testing, it is important to note the patient's ancestry as it may guide the panel of mutations used in the screening (some eg. mutations causing cystic fibrosis in Ashkenazi Jews differ from those found in people with northern European ancestry)

Presymptomatic or predictive testing

When the mutation conferring a risk of developing a condition in the future has been identified in a family, family members have the option of testing after genetic counselling

Cascade testing

Where a family member is found to have a gene mutation causing a genetic condition, conferring carrier status or susceptibility, cascade testing should be offered to blood relatives. Usually, it is the patient who is responsible for informing other family members. This process may be assisted by providing the patient with a letter to give to relatives containing relevant information and details of genetic services. Cascade testing is usually offered to those over 18 years of age

Table 3. Clinical context for referral to genetics services

- Conditions known to be genetic (eg. cystic fibrosis, haemoglobinopathy)
- Several family members diagnosed with the same condition, possibly at a younger age than usual (eg. some cancers, hypercholesterolaemia)
- Developmental delay or learning difficulties of unknown cause
- Dysmorphic features or congenital anomalies
- Neonatal or paediatric death of unknown cause
- Recurrent miscarriage
- Established genetic carrier status by testing

Support groups

All people living with a genetic condition (either personally or a family member) should have support to assist them in the management of their health and wellbeing and to enable them to reach their full potential.¹³ Support groups can be an important source of peer support, empowerment, practical information and advice about living with a genetic condition.¹⁴ They allow families to appreciate that they are not alone in the challenges they face living with a genetic condition (see *Resources*).

Conclusion

In response to the increasing use of genetic information in general practice, the role of the GP will include having to address the impact of a diagnosis or identified risk of patients and their families, facilitate informed decision making in regard to the options available, and provide support in the aftermath of such decisions.

A range of specialist genetics services including genetics support groups is available to the GP and/or specialist to assist in this role. Each service contributes to patient care and provides opportunities to meet the diverse and changing needs of both patients and their families.

Resources

- Centre for Genetics Education, NSW Health. Family health history record. Available at: www.genetics.edu.au
- Centralised contact point for information about local genetics services, familial cancer, prenatal testing and other specialist genetics services. Phone 1800 631 276, email gtis-australia@unimelb.edu.au
- The Australasian Genetic Alliance (AGA) is a network of peak bodies for the over 750 specific support groups for individual genetic conditions. Current secretariat: phone 02 9211 1462, email info@australasiangeneticalliance.org.au, www.australasiangeneticalliance.org.au
- The Translating and Interpreting Service can be reached 24 hours a day, 7 days a week by telephoning 131 450.

Conflict of interest: none declared.

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