Chapter 1

The impact of genetic disease on families

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Introduction
In primary care, the concept of family underpins and sustains much of what practitioners do. This was acknowledged previously when the name of the service that managed primary care services (in the UK) was the ‘Family Health Services Authority’ (FHSA).

However, during the 21st century, the members of a ‘family’ have become slightly harder to define. Now, the people grouped by our computer systems at any one address, may be:

- Parents, step-parents, partners.
- Children, step-children, adopted children, foster children, children from donor gamete conceptions, etc.
- Extended family members.

It is possible that PCPs will think of some family members as being ‘close’ and some being more ‘divided’. We are likely to know of families’ inter-relatedness by birth or co-habitation, and are likely to have cared for many of our patients for a long period.

This knowledge, together with our medical skills, often informs what we do and how we act, but:

The implications of the concept of ‘family’ for our understanding, investigation, and management of genetic disease are significant and should not be underestimated.

This chapter will explore both the positives of our long-term care of a population and some of the dangers to which we are exposed unless we challenge some of our thinking and behaviour. It will also examine some of the difficulties that face patients who have been diagnosed with a genetic problem.
Adoption

Introduction

Adoption is the legal transfer of parental responsibility from the birth family to a new adoptive family. In the UK the Adoption Act 1976 states that to be eligible for adoption the child must be under the age of 18yrs and there must be no possibility of continuing in the care of his/her birth parents. Should the child be married, or have been married, he/she cannot be adopted. In the UK, an Adoption Order severs all legal ties with the birth family and confers parental rights and responsibilities on the new adoptive family. The birth parents no longer have any legal rights over the child and they are not entitled to claim him/her back. The child becomes a full member of the adoptive family; he/she takes the surname and assumes the same rights and privileges as if he/she had been born to his/her adoptive parents, including the right of inheritance.

Adoption continues to provide an important service for children, offering a positive and beneficial outcome. Research shows that, generally, adopted children make very good progress through their childhood and into adulthood and do considerably better than children who have remained in the care system throughout most of their childhood.

Fostering is an agreement to offer a temporary home to children whose parents are unable to care for them. It is usually organized by social workers working for local authorities. The authority pays for the children’s accommodation and food.

An adoption agency is the organization that has arranged the adoption and has had contact with the birth and adoptive parents. The agency may be a state-run organization, a charity, or a profit-making company. The agencies have a statutory obligation to keep records of the adoption process.

Confidentiality. In the UK when an adopted individual reaches the age of 18 he/she can request the original birth certificate that will contain the mother’s name and address at the time of the birth. A birth parent is not able to obtain details of the child’s new family and name, although some contact between the birth and adoptive parents is more common now.

Consultation plan in primary care

PCPs are most likely to be involved in the adoption process by:

- Requests from an adoption agency for a medical report on prospective adoptive parents.
- Receipt of the medical records of a newly adopted child which should have had all previous surname data removed by the notifying authority.

Management in primary care

Given the complexity of the genetic issues outlined below, PCPs should discuss any genetic issues, with one or more of the following:

- The medical officer of the adoption agency.
- A community paediatrician with responsibility for adoption.
- A clinical geneticist.
Genetic issues relating to adoption

Genetic information given to adoptive parents

Family history

The birth parents are asked to give information about medical problems in the family. Often there is no contact with the father and this limits the information that can be given.

In the USA, the American Society of Human Genetics (1991) endorsed a statement concerning the importance of including a genetic history as part of the adoption process. Their recommendations are as follows and were written to encourage state and private agencies to collect helpful genetic histories.

- Every person should have the right to gain access to his or her medical record, including genetic data that may reside therein.
- A child entering foster care or the adoption process is at risk of losing access to relevant genetic facts about himself or herself.
- The compilation of an appropriate genetic history and the inclusion of genetic data in the adoptee's medical files should be a routine part of the adoption process.
- Genetic information should be obtained, organized, and stored in a manner that permits review, including periodic updating, by appropriate individuals.
- When medically appropriate, genetic data may be shared among the adoptive parents, biological parents, and adoptees. This should be done with the utmost respect for the right to privacy of the parties. The sharing of information should be bidirectional between the adoptive and biological parents until the child reaches an appropriate age to receive such information himself/herself.
- The right to privacy includes the right of any party to refuse to enter into, or cease to participate in, the process of gathering genetic information.

Known genetic disease prior to adoption

When there is a known genetic condition in the family (e.g. single gene or chromosomal disorder) the question of whether to test a healthy child for the condition may arise prior to adoption. 'It should not be assumed that genetic (predictive or carrier) testing will be required before a suitable placement can be achieved. In each case, we would advise discussion between the medical adviser to the adoption agency and a clinical geneticist. The important factors other than the possible laboratory test results need to be identified for future attention in advance of any test being performed' (Clinical Genetics Society 1994).

Genetic disorder diagnosed in child after adoption

The geneticist may be involved in the diagnosis of a genetic condition in an adopted individual that may be of importance to his/her birth family. Some adopted adults are in contact with their birth families but in most the route to passing on this information is through the adoption agency. The geneticist may write a brief letter stating the name of the condition that has been diagnosed in the adopted child and that this is a condition that could have genetic implications for the biological family, and recommending referral to their local genetic service. The medical advisor to the agency can assess...
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the information and it may be feasible for them then to contact the birth family. Records made many years ago are less complete and for individuals >18yrs old these may not be adequate to enable contact to be made with the birth family.

Genetic disorder diagnosed in birth family after a child has been adopted out
The geneticist may be involved in the diagnosis of a genetic condition or carrier status in the biological parent of a child who has been adopted out of the family. In most situations the route to passing on this information is through the adoption agency. The geneticist may write a brief letter stating the name of the condition that has been diagnosed in the biological family and that it could have genetic implications for the adopted child, and recommending referral to their local genetic service. The medical adviser to the agency can assess the information and, for those who are still <18yrs of age, should have the information to contact the parents of the adopted child. Records made many years ago are less complete and it may be more difficult to trace an individual, adopted as a child, who is now an adult.

Genetic testing
When a child is being considered for adoption the guidelines for genetic testing should be followed as for other children. The American Society of Human Genetics (ASHG) and the American College of Medical Genetics (ACMG) recommend the following:

• All genetic testing of newborns and children in the adoption process should be consistent with the tests performed on all children of a similar age for the purposes of diagnosis or of identifying appropriate prevention strategies.
• Because the primary justification for genetic testing of any child is a timely medical benefit to the child, genetic testing of newborns and children in the adoption process should be limited to testing for conditions that manifest themselves during childhood or for which preventive measures or therapies may be undertaken during childhood.
• In the adoption process, it is not appropriate to test newborns and children for the purpose of detecting genetic variations of or predispositions to physical, mental, or behavioural traits within the normal range.

Further information
American College of Medical Genetics (ACMG) www.acmg.net
American Society of Human Genetics www.ashg.org
British Association for Adoption and Fostering www.bAAF.org

Support group
Adoption UK www.adoption.org.uk
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Confidentiality and consent

Introduction
Confidentiality is a major issue for all healthcare employees and conflicts in the duty of confidentiality are common in all areas of medicine. There are some particular difficulties associated with genetic diagnosis and genetic testing because of the potential implications for other family members.

- PCPs usually care for several family, and extended family, members.
- PCPs are the only holders of a patient’s entire medical record.

PCPs must be particularly on their guard against the potential for breaching confidentiality when dealing with genetic issues.

Disclosure
The general duty to maintain the confidential nature of personal genetic information is not an absolute one. The Human Genetics Commission (HGC) note circumstances where it may be appropriate to disclose personal information. Wherever possible, this will be with the consent of the patient, and will be in the interest of the patient, of relatives, or of the wider public. The HGC recognizes that, exceptionally:

‘Disclosure of sensitive personal genetic information without consent may be justified in rare cases where a patient refuses to consent to such disclosure but the benefit to other family members or the wider public substantially outweighs the need to respect confidentiality.’

As far as courts are concerned, some in the US have begun to support decisions that direct clinicians to tell family members on a ‘right to know’ basis about adverse genetic information. One court case in the UK has agreed that a clinician could breach confidentiality in order to prevent serious harm, but did not establish a duty in law so to do. The Data Protection Act 1998 (UK) concerns the responsibilities of all who hold individuals’ personal data. This clearly includes the information held on patients by healthcare professionals but has no direct content that relates to genetic information.

The General Medical Council (GMC) in the UK has published recent guidance on both confidentiality and consent and does accept that there may be circumstances in which confidentiality may be breached, without consent, in the disclosure of genetic information.

If a PCP decides to disclose confidential information, he/she must be prepared to explain and justify that decision. In practice, such cases are rare and will usually be discussed and/or implemented in conjunction with a Clinical Genetics department so that the decision about the balance of interests is shared and agreed.
Coding of primary care computer records (see also Ethics, p. 18)

History
Although many PCPs were using electronic coding for entries in patients’ records from ~1990, the introduction of the Quality and Outcomes Framework to the UK GP contract in 2004 necessitated GPs recording much of their computerized patient records as READ codes. Whereas these codes are accurate for most day-to-day medical note-keeping, there are two technical problems when PCPs seek to apply them to genetic diagnoses:

- There are not enough codes to permit accurate coding of all genetic information, e.g. ‘FH: Chromosomal anomaly’ will require free text supplementation with further details.
- Coding may be about to change; the standard terminology for the NHS Care Records service will be SNOMED CT (the Systematized Nomenclature of Medical Clinical Terms).

Implementation
The British Society for Human Genetics (BSHG) has considered the holding of personal information to aid clinical care and diagnosis within genetics departments, and noted that ‘Family records are held in addition to individual patient records to facilitate clinical care. The heritable nature of genetic conditions means that it is considered good practice to hold genetic medical records for an indefinite period.’

This advice confirms what is held to be usual practice in primary care records which commonly retain patient-reported data, such as ‘Family history of ischaemic heart disease’, recorded if, for example, a son reports that his father has had a recent myocardial infarction. Important in this example is:

- The son has been made aware of his father’s problem either directly (i.e. his father told him) or indirectly (i.e. he obtained the information from another source).
- The diagnosis is not substantiated unless the PCP also looks after the son’s father.
- No consent has been obtained from the father for this information to be put in his son’s clinical record.

The question to be addressed is whether or not the same practice should be applied to information about genetic diagnoses? Is genetic information a special case?

Clearly, an individual can give consent to a geneticist to pass on genetic information to his PCP, which can then be recorded on his/her own medical record; but what of the coding of other family members?

Given both the sensitive and the very specific nature of most genetic diagnoses, a general approach might be that:

- The affected individual is encouraged (by their geneticist) to consent to the sharing of their personal genetic information with appropriate family members.
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The Joint Committee on Medical Genetics in their report of April 2006, *Consent and confidentiality in genetic practice*:

... strongly support the good practice of confirming and documenting that it is acceptable to an individual that his or her information may be shared and samples used for the benefit of other family members.

- The genetics team may then contact family members, giving them the information to which the affected individual has consented and asking them to either pass that information to their PCP or to allow the genetics team to contact the PCP directly.
- The PCP can then code other family members’ notes with as accurate a code as is possible.
- Parents may give consent for their children’s notes to be appropriately coded.

In practice, most families agree in principle to the sharing of information, though in reality it may remain within the immediate family unless there is considerable effort on the part of the health professionals to help disseminate the information. See the start of this topic for a reminder about disclosure without consent.

**Children**

In 1985, in England, Gillick challenged the right of a doctor to prescribe contraception to a girl under the age of 16 yrs without obtaining the consent of the girl’s parents. This became an important case in English law and Lord Scarman gave the following ruling in the House of Lords, ‘As a matter of law the parental right to determine whether or not their minor child below the age of 16 will have medical treatment terminates if and when the child achieves sufficient understanding and intelligence to enable him to understand fully what is proposed.’ It is a matter for a doctor to judge whether a child aged under 16 yrs is ‘Gillick competent’, i.e. is competent to make judgements about their own medical care. Furthermore, if a child is deemed ‘Gillick competent’ a doctor can only disclose information to the parent with the child’s consent, regardless of parental responsibility.

In the non-Gillick competent child, authority must be given by whoever has parental responsibility under the provisions of the Children’s Act 1989. In deciding whether to disclose information, the practitioner’s overriding consideration must always be what is in the best interests of the child.

A child’s biological parents both have parental responsibility if they were married at the time of the child’s birth. In such circumstances a practitioner will normally disclose all information concerning a young child to either parent without the other’s consent. When such parents are separated or divorced, information may still be disclosed to either parent irrespective of who has custody, unless a court has removed parental responsibility from one or other parent.

With parents who were unmarried at the time of the child’s birth, only the mother automatically has legal parental responsibility. Her consent is therefore required before information may be disclosed to the father, unless he has been given parental responsibility either by agreement with the mother or by a court order.
Deceased patients
Consent in such circumstances should be sought from the next of kin or executors of the deceased’s estate. The Human Genetics Commission recognizes that ‘There may be some clinical situations where genetic information about the dead is needed in order to assess the risk to a living relative. This information may be obtained by testing samples removed from an individual during life. The approach we favour is that a presumption should be made that the dead person would have consented in his or her lifetime to such testing and that this justifies post-mortem testing.’

Refusal of consent
While privacy and the right to refuse consent is an important proposition, it is not an absolute principle and it can be overridden if the harm to others outweighs the importance to the individual concerned, e.g. if the refusal of consent is capricious or vindictive.

Useful websites
General Medical Council (GMC):
British Society for Human Genetics:
- www.bshg.org.uk

Further reading
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Consanguinity

Introduction
A consanguineous relationship is one between individuals who are second cousins or closer. Consanguineous marriage is customary, for example, in the Middle East, parts of South Asia including Pakistan, in some Jewish communities, and amongst Irish travellers. Although the custom is often perceived to be associated with Islam, it is (usually) independent of religion.

In a birth study amongst northern European children (0.4% of parents related), the prevalence of recessive disorders was 0.28%, compared with British Pakistani children (69% of parents related) in whom the prevalence of recessive disorders was 3.0–3.3%. The effect is particularly marked for rare recessive disorders. The proportion of nuclear genes shared for a given degree of relationship is given in Table 1.1.

<table>
<thead>
<tr>
<th>Relationship</th>
<th>Proportion of nuclear genes shared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monozygotic twins</td>
<td>1 (100%)</td>
</tr>
<tr>
<td>First-degree relatives (siblings, parent:child, dizygotic twins)</td>
<td>1/2 (50%)</td>
</tr>
<tr>
<td>Second-degree relatives (half-sibs, double first cousins, uncle/aunt:nephew/niece)</td>
<td>1/4 (25%)</td>
</tr>
<tr>
<td>Third-degree relatives (first cousins, half-uncle/aunt:niece/nephew)</td>
<td>1/8 (12.5%)</td>
</tr>
</tbody>
</table>

There is no measurable increase in the rate of spontaneous abortion or infertility in populations with a high incidence of customary consanguineous marriage.

Terminology for relationships
- **First cousin.** Individuals are first cousins if one of each set of parents are siblings (A and B in Fig. 1.1).
- **Double first cousin.** Individuals are double first cousins if both of each set of parents, respectively, are siblings (E and F in Fig. 1.1).
- **First cousin once removed.** ‘Removed’ indicates a difference in generations, e.g. a first cousin once removed is the child of a first cousin (A and D in Fig. 1.1; also B and C).
- **Second cousins.** Individuals are second cousins if a paternal grandparent is sibling to a maternal grandparent, i.e. the offspring of first cousins are second cousins (see C and D in Fig. 1.1).
Consultation plan in primary care

History

- A detailed three-generation family tree including details of younger generations, i.e. cousins, nephews, and nieces.
- Where there is multiple consanguinity, drawing a family tree becomes complex and it may be helpful to supplement it by documenting in words the stated relationships in the family.
- If there is a family member with a known recessive disorder, or a potentially recessive disorder (e.g. microcephaly), highlight that individual as the proband in the family tree.

Management in primary care

Given the complexity of the family histories and the relatively increased risk of significant genetic disease, a referral should be made to Clinical Genetics. This is especially important if there is a family history of a genetic disorder.

Possible investigations in secondary care

The geneticist will ascertain if there is a specific genetic test relevant to the family. Autosomal recessive disorders with a known high carrier rate in a given ethnic group include:

- **Northern European/Caucasian**: Cystic fibrosis (CF) carrier testing.
- **Mediterranean**: Haemoglobinopathy screen (thalassaemia and sickle cell disorders) and CF carrier testing.
- **Ashkenazi Jewish**: Tay–Sachs carrier testing (carrier risk ~1/30 in Ashkenazim) and CF carrier testing (including W1282X) (see Chapter 5, Cystic fibrosis, p. 104).
- **African-American/African-Caribbean/African**: Haemoglobinopathy screen (sickle).
- **Indian/South-East Asian**: Haemoglobinopathy screen (thalassaemia and sickle cell disorders) and CF carrier testing. As a result of consanguineous marriage, the birth prevalence of children with CF is approximately the same amongst British Pakistanis as it is amongst northern Europeans (despite the lower CF carrier rate in the Pakistani population).
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Genetics

Inheritance and recurrence risk
This will be determined initially by whether or not there is a known, or possible, autosomal recessive (AR) condition in the family.

If there is a known or possible recessive disorder in the family, other consanguineous relationships within the extended family are at high genetic risk for that disorder.

In a family with no known AR disorder then empiric data can be used to estimate the genetic risk.
- The birth prevalence of serious congenital and genetic disorders diagnosed by 1yr for children of unrelated parents is 2.0–2.5%. For children of first-cousin parents the risk is doubled at 4.0–4.5%.
- Longer-term studies that include conditions diagnosed later in childhood (neurological disorders, thalassaemia, etc.) give an overall 4.0% risk for children of unrelated parents, with an approximate doubling of this risk to 8.0% in offspring of first cousins.

Carrier detection
Carrier detection for many metabolic disorders by conventional biochemical methods is problematic due to an overlap in values between heterozygotes (carriers) and normals. Where accurate carrier detection is not feasible by DNA mutation analysis or linkage studies, the clinical geneticist will calculate a risk from the pedigree and may offer additional ultrasound surveillance.

If there is a family history of a genetic disorder, offer to refer consanguineous couples to Clinical Genetics prior to pregnancy.

Prenatal diagnosis
Detailed fetal anomaly ultrasound scanning (USS) will detect structural anomalies that occur in a small percentage of pregnancies affected by severe recessive disorders (e.g. cystic kidneys, congenital heart disease, structural anomalies of the brain).
- Most severe recessive disorders will remain undetected as the great majority of metabolic disorders and neurodevelopmental disorders (leucodystrophies, etc.) will not be detectable by fetal USS.
- Detailed fetal anomaly USS will usually be offered to first-cousin relationships and closer, but the couple will be informed of the limitations.
- In the absence of a family history, routine obstetric USS is appropriate for relationships less close than first cousins.
- Prenatal diagnosis is available for most metabolic disorders that have been characterized previously in the family, using various sampling techniques, e.g. cultured/uncultured chorionic villus sampling (CVS) cells, amniotic fluid, amniocytes, DNA.
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Effects of genetic disease on families

The confirmation of the presence, or absence, of a genetic diagnosis can, as in all areas of medical practice, produce both positive and negative responses. PCPs are well used to both breaking bad news (e.g. a diagnosis of cancer) and also to reassuring patients that they do not have a medical problem (e.g. diabetes). Genetic diagnoses have the added dimension that most results may not only affect the individual concerned, but potentially their siblings, their children, and their, as yet, unborn children.

Unless PCPs are clear, either from previous genetic department advice held in the GP records, or from their own knowledge, genetic risk assessment should be done by genetics professionals.

Genetic diseases may evoke:

Fear
Individuals may be fearful at every stage:
- Approaching their PCP.
- Awaiting the initial contact with Genetics.
- Deciding whether or not to have genetic tests.
- Awaiting relevant results.
- Discussing the diagnosis with family and friends.
- Deciding whether to have (more) children.

Practitioners need to be gentle, supportive, clear, and concise in their explanations, checking back that those explanations are understood. They will need to allow time, maybe over several consultations, for patients’ fears to be explored as much as they require them to be. However, PCPs must ensure that family members, for whom they care, have their fears dealt with in a way that does not compromise confidentiality.

Guilt
Parents tend to feel guilty when adverse events (e.g. illness, accidents) happen to their children. The knowledge that one may have passed on an illness, or the susceptibility to an illness, to a child can lead to an abiding, and often painful, sense of guilt. This may arise at the time of diagnosis and again around the time when parents want to inform their children of their genetic inheritance. Discussion with the local Genetics department may be helpful in this situation.

Depression
The knowledge that an individual has a genetic problem and may have passed it on to the next generation, the decision to not have children, the decision to opt for the termination of an affected fetus all have the potential to trigger a depressive response of varying severity. Warning signs may include a patient’s description of their sense of hopelessness or inevitability. PCPs should use their normal screening tools (e.g. Patient Health Questionnaire (PHQ)) in the diagnosis of depression, and use local mental health services where required, but also be aware of the help that may be provided by genetic counsellors.
**Relationship jeopardy**

People in any relationship occasionally have to deal with the discovery of secrets from their past or their present, difficulties in communication, differences of opinion over whether to have children or not. The diagnosis of a genetic problem in the family may precipitate tension. The relationships potentially at risk are those between:

- A couple in their reproductive years
- Parent/child
- Inter-sibling

A known or potential genetic problem may jeopardize a relationship:

- **In the present.** Genetics professionals routinely, and expertly, counsel patients through the investigation/diagnostic pathway, but PCPs may well be approached for further support by those finding their personal journey difficult as their partner/parent/siblings struggle with the implications for themselves or their family members.

- **In the future.** There will be some individuals who need extra support when their diagnosis, possibly made in childhood or early adult life, needs further discussion as they embark on a relationship with child-bearing in mind. Couples may initially present to PCPs to discuss this following diagnosis of a genetic condition. This is the more likely event than the other possibility of non-disclosure of a diagnosis. Individuals may well wrestle with their own conscience in keeping back information and seek support from their PCP.

  Other family members may feel distress following the diagnosis of a genetic problem in their family. They may be fearful of its consequences or simply need further information. PCPs can recommend a referral to Clinical Genetics for advice. (See Referral to a genetics service, p. 80 and Family history of a possible genetic disorder, p. 202).

Unless genetic issues are dealt with sensitively, confidentially, and with appropriate consent, the patient’s relationship with their PCP may be jeopardized.

**Stigmatization**

Intolerant attitudes may cause distress to those with obvious genetic conditions such as achondroplasia. Better education on genetic issues in schools and the media may help to replace stigmatization with understanding.

Support groups for genetic disorders can: (i) provide peer and family support; (ii) provide information and advice; and (iii) help affected individuals and their families feel less isolated.

**Financial**

In spite of the current UK insurance moratorium and employment law, affected individuals may have fears about the impact of their genetic diagnosis on both their income and the affordability of insurance. While it is outside the remit of PCPs to give financial advice, some background information may be helpful—see Financial issues, p. 22.
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Ethics
Defined by the Oxford English Dictionary as ‘the science of morals in human conduct’, most practitioners in medicine or nursing will be aware of the four overarching principles of ethics: autonomy, beneficence, justice, and confidentiality. These are discussed in turn below.

Autonomy
This is the expectation that individuals have personal freedom and the ability, therefore, to determine outcomes for themselves. Within medicine, this would include the ability to make their own choices about the medical care they wish to receive. Responsible practitioners must therefore give patients the right information, at the right time, in the right (i.e. understandable) way. If information is delivered in such a way, the patient facing an intervention (e.g. genetic testing) will be better able to give informed consent. They may ask for guidance, as well as information, and here the clinician (doctor, nurse, counsellor) may have to make a judgement on how much guidance to give.

As genetic advice is sometimes difficult to explain and the ramifications of a genetic diagnosis may be extensive, advice to patients following a new genetic diagnosis will usually be offered in the first instance by the Clinical Genetics department. PCPs who are approached by patients or their relatives for guidance will need to recognize when they can provide advice and when they should refer their patient to the Clinical Genetics department (see Effects of genetic disease on families, p. 16).

Beneficence
Can be best exemplified by its counterpart, non-maleficence, enshrined in the oath traditionally taken by physicians and believed to have been written by Hippocrates, the father of medicine, in the 4th century BC:

\[
\text{I will prescribe regimens for the good of my patients according to my ability and my judgment and never do harm to anyone.}
\]

It is the doctor’s duty to leave the patient in a better, rather than a worse, state after treatment. In genetics, there are situations in which good may be done for one person, for example by agreeing to their request for non-disclosure of a diagnosis to other family members, which may in turn harm others who thus remain ignorant of their genetic risk as a consequence of the non-disclosure.

Genetic diagnoses or susceptibilities may place intolerable pressures on some patients, or their families, and members of the primary care team need to be able to recognize when individuals or families are under strain (see Support, p. 30).

Justice
Fairness for all in access and opportunity is an ethic to be applied within the bounds of what is possible within a health service.

An individual’s right not to undergo genetic investigations, or not to reveal their results to other at-risk family members, may be viewed
either: (i) as their right to autonomy; or (ii) as a denial of an opportunity to others, including their unborn children.

Confidentiality
Confidentiality is regarded as a core principle of healthcare; the issues raised by genetic diagnoses can create conflicts of duty (see Confidentiality and consent, p. 8). Factors to consider when considering annotating the records of other family members with information about a genetic diagnosis in the family include:

- **Avoidance of harm**: some genetic conditions may have serious implications during childhood, e.g. a family history of sensitivity to anaesthetic agents. Where this is the case there are grounds for making sure that the information is noted in the medical record in order to prevent avoidable harm. Because this is not a breach of confidentiality, the harms don’t need to meet the standard of ‘risk of death or serious harm’. They just need to be harms that the parents and the doctor agree are important and that a child might reasonably wish their health professional to be informed about.

- **Patient expectation**: even where there are no implications in childhood, the avoidance of future harm, the parents’ consent, and the child’s reasonable expectation that their health professional will be informed, may be sufficient grounds in themselves, for ensuring that the information is available for health professionals and (ultimately) for the child him/herself.

- **Children**: one of the concerns in current practice hinges around the implications of not testing children for diseases of adult onset for which they are at risk or for carrier status (see Genetic testing of children, p. 24). Family contact can be very easily lost as the years pass by. When a parent is told to inform their child and to bring him/her back for testing when she is older, this may not happen in practice—people forget, decide not to tell, or families break up. If there is a note in the child’s file (e.g. family history of Duchenne muscular dystrophy), this can be followed up at a later date by his/her doctor, wherever and whoever this is.

- **Seeking the patient’s views**: there are other ways of respecting the ‘right not to know’. For example, when people first register with a practice (or have their first ‘adult’ appointment) they could be asked (making it clear that this is a general policy question and not a specific individual question) for their views on being informed about inherited disorders. When would they want to know and when wouldn’t they? If the information isn’t recorded at all, patients will be deprived of a much more important right—‘the right to be informed if they want to be’—and the right to be provided with informed health care. They might otherwise be at risk of serious and avoidable harm caused by ignorance of the family history.

The triple helix of medical ethics
Medical ethics is a vast and controversial area. One can think of genetic medical ethics as a triple helix made up from three backbone strands:

- What you believe is right (after thoughtful contemplation of pros and cons).
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- ‘Standard practice’ amongst clinical geneticists and/or PCPs.
- The law or various rulings/guidelines recommend (see GMC and Ethox websites).
  These three strands may be identical, similar, or at odds with each other. They are loosely stuck together by clinical experience, and communication between you and the family and other professionals involved in a particular case. Professionals must be continually aware of their own prejudices. If you are in doubt, always seek advice.

Useful websites

BSHG:  www.bshg.org.uk
General Medical Council (GMC):  http://www.gmc-uk.org
The Ethox Centre, University of Oxford, is dedicated to enhancing patient care by improving ethical understanding and ethical standards (see Chapter 11, p. 430).

Further reading

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Financial issues
Most medical diagnoses have implications for an individual’s financial status, be that regular payment for prescriptions, lack of pay for periods of time off work, extra outlay to obtain requisite care or mobility needs, etc. From this point of view, genetic diagnoses are the same, although they:
- May cause significant mortality and morbidity from birth.
- May produce systemic illness many years after predictive testing.
- May have financial implications for those outside the immediate family group.

Insurance
Insurance usually operates according to one of two different principles:

Solidarity
The UK National Health Service (NHS) is an example of an organization that, although run by government, essentially operates according to the principle of solidarity. Here, there is no differentiation between those at low risk or high risk, with all reaping the benefits of available health care according to their health needs.

Mutuality
A mutual insurance company accepts money from customers at a rate that, from actuarial statistics, will vary according to the customer’s health status. They may not wish to insure people who have a high risk of poor health and reduced life expectancy. The contributions, and individuals’ risks, are pooled and payments made when necessary, but, over time, enough people survive for the company to make a profit.

PCPs often receive requests for specific health data on a named individual by means of a Personal Medical Attendant (PMA) report from a mutual insurance company.

In recognition of the facts that both the amount of genetic investigation of patients is increasing rapidly and that genetic information about any one individual and their family can have huge significance for their actuarial risk, a moratorium was negotiated in 2006. This voluntary agreement, known as the Concordat and Moratorium on Genetics and Insurance was agreed between the Association of British Insurers (ABI) and the UK government, with the assistance of the Genetics and Insurance Committee (GAIC) and Human Genetics Advisory Committee (HGAC). The moratorium has been extended to 2014, with no review planned before 2011.

The essence of the Concordat as it affects PCPs is that:
- Patients will not be put under pressure to undergo predictive genetic testing.
- Patients will not be asked to disclose the results of genetic tests performed within their family.
- Insurers may ask patients or their PCPs for their family history and their genetic test results with their consent.
- Patients may be asked to disclose predictive genetic test results for (as an example)
  - life policies for >£500 000
  - critical illness policies for >£300 000
  - income protection policies for >£30 000.
Patients with adverse predictive tests would not be treated unfavourably by their insurer without justification.

The use of predictive genetic tests will be continually reviewed. PCPs may be put in a difficult position when they are asked to provide a report to an insurer, as they have both a commitment to the insurance company, who are paying for the report, and to their patient. In such a case, it could be good practice to ask to see the patient to discuss the completed report before it is sent, and to explain the content with reference to the moratorium, or to ask the patient to exercise their right to see the report (which few patients actually exercise), again, with an explanation beforehand of the boundaries of the moratorium.

**Employment**

The issues raised in the debate about the use of genetic information as regards an individual’s employment, are similar to the insurance debate above.

Employers increasingly request potential employees to provide medical information before firm offers of employment are made. PCPs may then be approached, with their patient’s consent, to elaborate on that information if there is a concern raised about the patient’s suitability for employment on the basis of their provided medical history.

‘**Inside information’**

A report from the Human Genetics Commission (HGC) in the UK in 2002 and a follow-up report in 2006 found that:

- There was little evidence to justify the use of genetic testing by employers for health and safety purposes or recruitment decisions, and little evidence that employers had plans to introduce such measures.
- Employees should not be forced to take genetic tests as a precondition of their employment.
- Employers should inform the HGC voluntarily if they have plans to introduce predictive personal genetic information pre-employment.

These responses are broadly supported by the UK Disability Discrimination Act of 1995. In the USA, an executive order signed by President Clinton in 2000 forbad the use of genetic information in employment decisions for those in federal departments, and US congress is considering an act aiming to protect all citizens against unwarranted genetic testing.

Progressive genetic conditions, however, can impact on a patient’s continuing employment. As with any other medical disorder, PCPs will need to advise patients if they believe them to have a physical or mental risk within their field of work. The affected individual should be encouraged to be open with their employer either directly or through employer’s occupational health schemes if they, or their PCP, perceive a risk in the workplace. Health reports subsequently requested can then be clear about the physical or mental aspects of an illness that may have an impact on their work.
Genetic testing of children

The best interests of the child need to direct genetic testing.

In general, predictive genetic testing of children is only undertaken when the potential benefit of testing can reasonably be viewed as outweighing the disadvantages of testing; particularly (i) removing the child’s autonomy, when more mature, to be involved in decisions affecting his/her own future; and (ii) the risk of stigmatization. It is usually undertaken when the child is at significant risk for a genetic disorder for which screening is burdensome and effective treatment is possible, e.g. retinoblastoma or familial adenomatous polyposis (FAP).

PCPs will rarely be asked to test children directly, except for in-surgery paternity testing (see Paternity testing, p. 28), but may find the following guidance from the American Medical Association (1996) useful:

- When a child is at risk for a genetic condition for which preventative or other therapeutic measures are available, genetic testing should be offered or, in some cases, required. An example of such a disorder would be cystic fibrosis.
- When a child is at risk for a genetic condition with paediatric onset for which preventive therapeutic measures are not available, parents generally should have discretion to decide whether the child should undergo genetic testing.
- When a child is at risk for a genetic condition with adult onset for which preventive or effective therapeutic measures are not available, genetic testing of children generally should not be performed. Families should still be informed of the existence of tests and given the opportunity to discuss the reasons why the tests are generally not offered for children. An example of such a disorder would be Huntingdon disease.
- Genetic testing for carrier status should be deferred until the child either reaches maturity or needs to make reproductive decisions.
- Genetic testing of children for the benefit of a family member should not be performed unless testing is necessary to prevent substantial harm to the family member.
- Consent can be given by a competent young person (see Confidentiality and consent, p. 8).

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CHAPTER 1 Impact of genetic disease on families

Holistic care

Both undergraduate medical training and general practice training, championed by the UK Royal College of General Practitioners (RCGP), have endorsed the practice of holistic care for some years.

Centred on the patient

Care that maintains patients at its core will:

- Hear their concerns.
- Examine and investigate them appropriately and considerately.
- Check their understanding of explanations given and options available to them.
- Remain non-directive in further discussion of treatment options while patients make their own decisions.
- Maintain an awareness of their personal, cultural, ethical, and religious beliefs, particularly where these affect attitudes to family systems, fertility issues, pregnancy, etc.
- Give consideration to the psychosocial effects on the individual.
- Explore medicine in relation to their employment.

Confidentiality and consent

See Confidentiality and consent, p. 8.

Although genetic disease has implications for all family members, an individual patient should expect their medical information to be kept confidential until they give their consent for it to be shared. A PCP, who is likely to be caring for other family members of an affected individual, must remember this, and may need to seek advice if conflicts arise.

Clear communication

All PCPs are familiar with the patient who books an appointment to ask ‘What did the hospital say?’, expecting clarification or confirmation of information given during an outpatient appointment with the genetics service. To provide good care, PCPs must be able to communicate clearly, which means having a basic understanding of:

- Patterns of inheritance (see Chapter 2).
- The tests in use for genetic diagnostic and predictive testing (see Genetic investigations, pp. 74–77).
- The validity and limitations of those tests.
- Principles of risk assessment for genetic disease and common chromosomal anomalies.
- Reproductive options available (see Reproductive options, p. 400)
- Other sources of information and support for patients which clarify or add to the information we are trying to communicate (see Chapter 11, pp. 421 and 422).

Continuity of care

Working with a local population provides the PCP with daily insights into the society for which they care. Primary care is a powerful instrument for
the follow-up of patients at risk of a genetic condition, or those who have a genetic condition for which non-specialist surveillance is indicated.

**Co-ordination**

Genetics crosses many medical specialty boundaries (e.g. paediatrics, obstetrics, oncology, ophthalmology) and many specialist services are established already where clinical geneticists hold joint outpatient clinics with other specialty colleagues. It remains common, however, for primary care to hold a role, for many of their patients, in effectively co-ordinating their care. This skill could be increasingly utilized in the provision of care to patients with a genetic disorder.
Paternity testing
PCPs first began to participate in genetic investigation when paternity testing was introduced several years ago. Such testing is usually performed by a private laboratory at the request of a solicitor, or court, in cases where paternity is disputed. Initially requiring blood tests from the child and both parents, it is now usually performed using DNA extracted from a buccal swab or saliva sample.

Occasionally, one or other parent may ask for a private test to be done on their child, without legal behest. A PCP should consider here whether the test is, or is not, in the child’s best interest and whether the result will confer any benefit, or harm, in both the short and the long term. If in doubt, get further advice before participating in the testing.

Disclosure of non-paternity during genetic testing

Some genetic tests have the potential to reveal non-paternity. Unless this potential is recognized and discussed in advance of testing, a test result revealing non-paternity raises serious ethical dilemmas.

In practice, clinical geneticists try to foresee situations where tests could potentially disclose non-paternity and include discussion of this topic in the pre-test counselling. Occasionally, unusual genetic mechanisms suggest non-paternity, but more thorough analysis reveals parentage to be true.

Examples of genetic tests that may disclose non-paternity include:
- Parental carrier testing, where both mutations have been defined in the affected child.
- Linkage-based tests where haplotypes are determined for different family members—when these results are collated discrepancies may be seen.
Private (‘direct to consumer’) genetic testing

Genetic screening is coming to the masses.
Sunday Times, 1 March 2008

Introduction
It was inevitable, with the announcement of the sequencing of the human genome in 2003, that personal genome scans would soon be offered by private companies. Genetic testing can be accessed via web-based services such as ‘deCODEme’ and ‘23andMe’ offering, for ~£500, to assess a person’s DNA from a posted buccal swab, and to give a risk assessment for 20 common diseases, such as ischaemic heart disease, diabetes, and prostate cancer. It is still too early for most tests that are based on newly discovered associations to provide stable estimates of genetic risk for many diseases. One of the first genomes to be sequenced in full was that of James Watson (who, with Francis Crick, discovered the structure of DNA).

Currently, the advertising of medicines in the UK is illegal, but the advertising of medical tests is not. Consumers can buy pregnancy or ovulation testing kits, or have their blood cholesterol and glucose tested on the spot, or have their blood pressure measured in the high street. There are calls for the regulation of the testing industry, including genetic testing.

Genes Direct
The Human Genetics Commission (HGC) in the UK published their analysis of the need for regulation in 2003 in Genes Direct: Ensuring the Effective Oversight of Genetic Tests Supplied Directly to the Public. In this, the argument was made for a mixture of statutory and voluntary controls for private genetic testing.

• **Statutory regulation** of tests for the diagnosis of genetic disorders was suggested, whereby they could only be administered by health professionals. This is because the results may have physical, mental, and social consequences, both for the individual tested and their family members, and would necessitate expert genetic counselling prior to testing.

• **Voluntary regulation** was suggested for tests that offer a guide to a person’s susceptibility to a given disease or range of diseases. Such tests are deemed to be comparable to the blood pressure screening or cholesterol measurements, in that they may be helpful in guiding an individual to consult a health professional for further advice and/or treatment.

With the expectation that it would be a PCP to whom the person would turn for interpretation of their results, the HGC concluded: ‘We feel strongly that there should be a well-funded NHS genetics service supported by a genetically literate primary care work force, which can properly manage and allow access to new predictive genetic tests that are being developed.’
Support

The problem with the gene pool is that there is no lifeguard.

The care of people with chronic disease occupies a large part of a PCPs working life. The nature of the long-term relationship with a PCP, the fact that they hold the patient’s entire medical record, and both the quality and power of computerized health records, strengthen the availability and appropriateness of that care.

Individuals with a genetic problem may not only have their life affected by a ‘chronic disease’, but, potentially, the lives of those around them or those yet unborn. The strains put on such lives are not to be underestimated.

Short-term support

Inevitably, the initial support given to people receiving a genetic diagnosis and/or risk assessment will be delivered by those trained for the task, clinical geneticists and genetic counsellors. A small number of patients may exercise their right to refuse the diagnosis being notified to their PCP, but most will allow free communication with their PCP, who will then be clearly informed of both the diagnosis, and the nature of the support that their patient is receiving.

Longer-term support

The PCP needs to maintain as much psychological and physical support as the individual, or family, requires, particularly at such times as:

- Assisted conception involving pre-implantation genetic diagnosis (PGD).
- A new pregnancy facing early genetic diagnosis by CVS, amniocentesis, or USS.
- Termination of an affected pregnancy.
- An unexpected genetic problem at birth.
- The death of an affected child.
- Teenagers discovering an adverse family history for the first time.
- New relationships in adult life.
- Separation/divorce.

At such times, liaison with genetic services may be considered for short-term support, possibly in conjunction with the other support available through local psychological services, or the support groups mentioned throughout this book.

Liaison with other agencies

In a more general sense, PCPs regularly deal with outside agencies, and genetic care may involve the following:

Education

- Nursery care.
- Special Educational Needs Co-ordinators (SENCOs).
- Teaching staff in both mainstream and special education.
- Transition services for learning disabled teenagers moving from education to employment.
Combined social services/health
- Community Learning Disability Teams (CLDTs).
- Physical disability teams.

Department of Work and Pensions (DWP)
- Disability living allowance.
- Carers’ allowances.
- Mobility allowances.
- Incapacity benefit.
- ‘Permitted work’.

Local councils
- Housing.
- Travel passes.
- Disabled driver parking places and car badges.
- Council tax exemption.
- Proxy voting rights.

Solicitors
- Medical negligence awards.
- Applications for power of attorney (for those who are competent to do so).
- Applications to the court of protection (for those who lack mental capacity).

The caveat in all such dealings for medical and nursing staff is to be sure when their patient’s consent is required before information is passed on, e.g. to lawyers, employers, etc. Always ensure that you are acting, where possible, in your patient’s best interest.

Support groups
The Genetic Interest Group (GIG) is a national alliance of patient organizations with a membership of over 130 charities which support children, families, and individuals affected by genetic disorders (® www.gig.org.uk).
Termination of pregnancy

In the UK, a termination that is performed as a result of genetic testing remains subject to the provisions of the 1967 Abortion Act, which made termination legal in the UK up to 28 weeks’ gestation. An amendment made to the Act in 1990 by the Human Fertilization and Embryology Act made it legal only up to 24 weeks, except as outlined below. Thus, as UK law stands at present, termination of a pregnancy can occur provided two doctors sign a document (Certificate A: HSA1) confirming that one of the following pertains:

- The continuance of the pregnancy would involve risk to the life of the pregnant woman greater than if the pregnancy were terminated.
- The termination is necessary to prevent grave permanent injury to the physical or mental health of the pregnant woman.
- The pregnancy has NOT exceeded its 24th week and that the continuance of the pregnancy would involve risk, greater than if the pregnancy were terminated, of injury to the physical or mental health of the woman.
- The pregnancy has NOT exceeded its 24th week and that the continuance of the pregnancy would involve risk, greater than if the pregnancy were terminated, of injury to the physical or mental health of any existing child(ren) of the family of the pregnant woman.
- There is a substantial risk that if the child were born it would suffer from such physical or mental abnormalities as to be seriously handicapped.

In 2005 there were fewer than 200 terminations after 24 weeks, accounting for 0.1% of the total. The act does not extend to Northern Ireland. Abortion is only legal there if the life or the mental or physical health of the woman is at ‘serious risk’.

PCPs will be aware of such legislation and most will be experienced in counselling women, or couples, requesting termination of a pregnancy. The moral/ethical arena will continue to resound to arguments on either side of the debate—further liberalization or further restriction, the rights of the unborn against the rights of the mother, the right of a parent to raise a child with problems identified before birth against the rights of society to shoulder the cost of raising such a child. PCPs, in practising holistic care, must find ways to place their patient’s beliefs and moral stance to the fore, and keep their own internal struggles to the background.

Maternal risks

It is important to remember that women, particularly with certain dominantly inherited conditions (e.g. myotonic dystrophy, hypertrophic cardiomyopathy, and Marfan syndrome) may be at higher medical risk during termination. The PCP should alert the O&G team.
**Late effects of termination**

Termination of pregnancy can have both immediate effects (e.g. haemorrhage, uterine perforation, infection), and later, largely psychological repercussions. These may include:

- Depression/anxiety
- Denial
- Social withdrawal
- Relationship difficulties
- Fear of discovery by others of the termination
- Drug or alcohol abuse

Earlier discussion (see Effects of genetic disease on families, p. 16) alluded to some of the difficulties that family members may experience if there is a genetic disease or risk in the family, and the termination of an affected fetus may magnify many of those described difficulties for both the individual who has the termination and other family members. PCPs, in consideration of their patient’s needs, may consider referral for supportive counselling for those women suffering psychologically after termination of a pregnancy.

**Support group**

ARC: Antenatal Results and Choices: www.arc-uk.org