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The British Society for Genetic Medicine

Consent and confidentiality in genomic medicine

Guidance on the use of genetic and
genomic information in the clinic

3rd edition, July 2019

A report of the Joint Committee on Genomics in Medicine

This report, *Consent and confidentiality in genomic medicine*, is the third such report from the Joint Committee on Genomics in Medicine (previously, the Joint Committee on Medical Genetics). The first report was published in 2006 and the second in 2011. Because of the many advances in genetic and genomic practice, each report has involved a substantial rewrite.

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Foreword



This revision of the guidance on consent and confidentiality is very timely. Good stewardship of genetic information is essential to the provision of high-quality care. Experience shows that in most cases patients are happy to consent to their genetic information being used to underpin advice and care for their families and they should routinely be given the opportunity to record this expectation. Clinical genetic practice usually uses the family tree as a starting point for discussions, so that familial communication is built into the consultation; indeed many seek a referral for the benefit of family members even if there is no obvious benefit to self. Genetic information is personal, and often at the same time, familial.

As we aim to deliver personalised genomic medicine through mainstream specialties this insight needs to be extended. The chief medical officer's report, *Generation genome*, drew attention to the responsibilities of all clinicians and health services to prepare for the opportunities that this welcome step brings. As the (then) Human Genetics Commission recommended in 2002, health professionals should recognise the value of familial solidarity and altruism, and encourage or facilitate the appropriate sharing, or communication, of relevant information with relatives. This is consistent with the principles that are deeply embedded in our much-valued NHS. An extensive recent public dialogue has shown that there is wide public support for an approach based on altruism, reciprocity and solidarity.¹ This revised guidance is an important step in supporting health professionals to take that forward in their practice.

The regulatory context is not always easy for health professionals to understand. The implementation of the General Data Protection Regulation (GDPR) has prompted careful consideration of the sensitivity of health information, but it is not aimed at obstructing good clinical care. Respect for individual privacy need not, and should not, prevent health professionals advising patients on genomic risks that have come to clinical attention through the results of another person. The assumption that confidentiality towards individuals is always paramount is as inappropriate as the assumption that disclosure is always permissible, and any decision will need to be tailored to the individual circumstances of the case.

The importance of this guidance is that it provides practical support for professionals in interpreting the law, regulatory guidance, and expectations of public ethics (namely both the ethics of the public and the ethical obligations of those taking decisions in public roles). It does this by explaining what is at stake but also illustrating it with concrete examples. It will play a crucial role in ensuring that genomic advances work for patients and families, while respecting their rights. It is very welcome indeed.

Professor Sir Jonathan Montgomery
Professor of healthcare law, University College London

Executive summary

- Genetic or genomic tests are increasingly used in everyday medical practice. Every clinical field will encounter such tests to a greater or lesser extent [section 1].
- Health professionals from all areas of medicine need to know and understand how consent and confidentiality issues may arise in genomic medicine, and to understand the potential ways in which the use of genomic tests may change the nature of the relationship between healthcare professionals and patients [section 2].
- Multidisciplinary team discussion or a forum such as a hospital clinical ethics committee or UK Genethics meeting (www.genethicsUK.org) may be useful to discuss and resolve issues around consent and confidentiality where they arise in clinical practice.

Confidentiality

- The health professional's duty of confidentiality is not absolute, since it is balanced by a duty of disclosure under certain circumstances [section 2.2].
- When considering disclosure, you should document how you have weighed in the balance the obligation to respect an individual's confidence with the obligation to communicate potentially clinically relevant information to other family members [section 2.2].
- Such a balancing exercise will usually include discussion with other members of the healthcare team and be necessary where clinicians are aware of particular relatives who might benefit from knowing about their risk, but are unlikely to hear about it without health professional intervention [section 2.2].
- Health professionals should consider whether it is appropriate to separate confidential clinical information about one person from the shared familial inheritance that led to the clinical findings. If so, it may be possible to tell a person they are at risk of a condition, without breaching the confidence of the person in whom that genetic result was first discovered.

Consent

- The process of seeking consent ensures that a person understands the nature and purpose of the procedure or intervention thereby asserting a right to self-determination [section 3].
- Consent is often integrated into a clinical consultation and may be evidenced by good documentation but a signature on a form will not necessarily indicate what consent has actually been given. Model forms to record consent discussions are provided. Modifying such forms with additional riders or boxes is inappropriate for clinical practice and may compromise the actual consent obtained.
- The many possible outcomes from a genomic test, now and in the future, anticipated or unexpected, individual or familial, can mean that 'fully informed, specific' consent is difficult to achieve. Broad consent can still be valid consent.
- When considering using a genomic test, the following elements might usefully be included in a discussion with your patient [section 3.1]:
 - Test results may predict future health as well as diagnose current problems.
 - Results may be relevant to other family members.
 - Genomic test results may take longer than other medical tests: patients should be given likely timescales for availability of test results, or components of the results.
 - The scope and limits of the proposed testing (ie what will, and will not be tested for and communicated, as well as when and how).
 - Genomic tests may generate additional, unexpected or incidental findings.
 - Outcomes from genomic testing may be uncertain or unclear.
 - Interpretation of genomic results may be updated in the future and may need periodic re-evaluation.

- DNA samples are routinely stored and may be routinely used as quality assurance for clinical testing in others.
- It is often necessary to compare genomic data across the NHS or occasionally outside it to gather evidence to inform genomic interpretation; absolute anonymisation may not be possible and might compromise the utility of sharing.

There are 17 case examples interspersed throughout the text to demonstrate how these issues have arisen for practitioners in the past, each with key points for consideration should similar situations arise:

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1 Fundamentals of genomic medicine

This document is the third edition of this guidance and builds on previous editions to make recommendations for good practice. It has been revised and rewritten to coincide with the launch of the NHS Genomic Medicine Service² which has the aim of delivering genomic medicine throughout the UK.

Genetic or genomic tests are increasingly used in everyday medical practice.^{3,4} Every clinical field will encounter such tests to a greater or lesser extent. One key reason for the increasing scope and use of such testing is technology driven: over recent years, genetic technologies have become manyfold faster and cheaper. This has meant it has become easier to analyse a whole, or large sections of a, genome in detail; previously whole genome approaches had low resolution, and more detailed approaches were mainly clinically targeted testing of individual genes or groups of genes. Health professionals from all areas of medicine need to know and understand how consent and confidentiality issues may arise in genomic medicine, and to understand the potential ways in which the use of genomic tests may change the nature of the relationship between healthcare professionals and patients.

Compared with just a few years ago, today's technologies provide far more data than ever before, resulting in a number of new ethical challenges. The move from targeted genetic analysis to whole genome approaches has resulted in questions about what constitutes valid consent to whole genome testing, since there are so many possible outcomes. Analysis of an entire genetic code (the genome) could reveal a whole range of susceptibilities to disease, of varying severity, certainty and timelines. Although the majority of the code is currently uninterpretable, this is likely to change as knowledge grows. Ensuring a sufficiently informed consent process for all these possible contingencies is increasingly challenging. A whole genome sequence is therefore better regarded as 'the assay', while interrogation of particular parts of it is better regarded as the specific clinical 'test' requested for that patient at a particular time. This allows for focus to answer specific clinical questions (rather than needing to communicate everything at the same time), however it remains challenging to take account of incidental, additional or uncertain findings. Each of these may have current or future health implications yet cannot be anticipated in any routine way.⁵

One much claimed advantage of *whole* rather than *targeted analysis* of a genome is the resultant opportunity to look for other – perhaps unexpected – disease-associated variation(s). The extent to which other susceptibilities are sought will depend on a range of factors including: whether the variant can be reliably interpreted; evidence for subsequent actions (surveillance, treatment); size of risk; and what a patient would like to know, which in turn will require new approaches to communication about genetics and the consent process. It will also require much more knowledge about how disease-associated variants behave when detected in such opportunistic ways, since most current management information is derived from families or patients presenting with disease.

Another feature of genetic and genomic medicine is that findings in one person may also be relevant to the healthcare of members of that person's family, because much genetic information will be common to both. Indeed, genetic testing may only be requested because of wider knowledge about a condition within a family. Testing one person can therefore reveal information about the chances of a condition occurring in their close relatives. Providing the tested person with a right of veto over communicating such information may be unsound because it does not take sufficient account of the familial aspects of genetics.⁶ At the same time, respecting confidential information is an important aspect of clinical practice, and is vital in securing public trust and confidence in healthcare.

This new guidance is based on the assumption that both bioinformatics and the clinical assessment of a phenotype and/or family history will remain key components in the assessment of most genetic variants. Clinicians therefore need to understand if/how/when relatives need to be alerted to their risks discovered through others. This requires different ways of thinking about consent and confidentiality than in many other branches of medicine.

Box: Points for practitioners



- Genomic information is often complex and much genomic variation has unclear, uncertain or limited clinical significance.
- Genetic tests may be predictive or diagnostic (or have elements of both) and may accordingly have different impacts on clinical management.
- Some genetic variants may only predict disease well if found in the context of a medical or family history of the relevant disease.
- Information found in one person may inform the healthcare of their family members; approaches that focus solely on individual patients neglect this aspect and risk creating problems later on.
- Genomic variation may reveal unexpected information, for example, about family relationships.
- Large international data collections will often be necessary to gather the evidence of clinical manifestations of a particular variant.
- There is a clinical/research continuum, and some testing and interpretation occurs at this boundary and cannot clearly be categorised as one or the other.

2 Issues of confidentiality in genomic medicine

A fundamental ethical obligation owed by health professionals to their patients is confidentiality, a duty which underpins healthcare and is also recognised in law. The health professional's duty of confidentiality is not absolute, since it is balanced by a duty of disclosure under certain circumstances:

- if the patient agrees, or
- the disclosure is of overall benefit to a patient who lacks the capacity to consent, or
- the disclosure is required by law or is permitted/approved under a statutory process, or
- when disclosure can be justified in the public interest such as where 'failure to disclose the information leaves others at risk of death or serious harm'.⁷

A decision to breach confidentiality in the public interest will often involve complex decisions and finely balanced judgements, but one type of justification in genomics may be when a failure to disclose information leaves relatives ignorant of a significant risk of a condition that might be preventable or treatable.

2.1 Communication of familial aspects without breaching confidentiality

A genetic diagnosis in one person can, depending on the circumstances, suggest that others might also have inherited the condition or trait. Sometimes the family history and/or clinical presentation of disease will strongly suggest that a relative also has the genetic variant in question, even if they have not (yet) been tested. At other times clinicians may identify relatives who may not know they have an increased risk of a genetic condition.

Health professionals can find it difficult to know how to preserve the confidentiality of one patient and at the same time alert a family member of their risk of a particular condition. One way of doing this is to restrict the information that is provided to relatives. For example, if the clinical details about an index patient remain confidential, then relatives can be alerted that they might be at risk of developing a condition because of a family history (they perhaps already know about), or because of other information the clinician does not need to specify. This provides a way of alerting relatives that does not breach the confidence of the index patient.^{8,9} Providing information about a familial risk is *not the same* as disclosing personal medical information about a relative, even if a relative subsequently uses this to make inferences about others. In addition to this approach, it is possible that a legal duty to inform relatives in certain very specific situations may arise in the future (see section 2.2.2).

As genomic medicine generates more information about the heritable basis of symptoms or a condition, clinicians will need to understand when, and how, they may be able to communicate genetic information to at-risk relatives.

2.2 Professional guidelines and the law about confidentiality

The requirement to keep personal identifiable data confidential is enshrined in UK law through professional guidance and in relevant court judgments (the common law) and also in related legislation. Confidential information includes clinical information about diagnosis or treatment, photos or other images of the patient, test results including genetic variants arising from genomic sequences, pathology reports, and the details of the health professionals and the clinics the individual attends. This requirement arises regardless of the form that data is held in – 'whether written, computerised, visually or audio recorded or simply held in the memory of health professionals'.¹⁰ However, concerns about confidentiality should not prevent health professionals

from sharing relevant information with members of a multidisciplinary team who are all involved in delivering healthcare.

2.2.1 General Medical Council

Codes of professional practice recognise the importance of keeping personal identifiable information confidential. For example, the General Medical Council (GMC) recognises the general obligation to keep information confidential but considers that in certain circumstances an exception may be made: disclosure to others without consent is justified 'if failure to do so may expose others to a risk of death or serious harm.' The level of risk that would justify disclosure without consent is not defined, but it is made clear by the GMC that in certain situations health professionals may be faced with genetic information about one person which relatives might benefit from knowing. Where the interests of a patient and relatives conflict, such as in the disclosure of genetic information, the GMC states that if a patient refuses to disclose relevant information to relatives, clinicians need to 'balance their duty to make the care of their patient their first concern' against their 'duty to help protect another person from serious harm'. However, in contrast to its more general advice about breaching confidence, the GMC also states that doctors should not disclose the patient's identity when contacting relatives and advising them about the risks they face, thus acknowledging that familial and individual information might be separable.¹⁰

2.2.2 Legal cases about disclosing information to relatives

The question of when clinicians should consider communicating relevant genetic findings to relatives has been discussed in a recent UK case.[†] Although this case has been remitted for trial in the High Court at the time of writing, and is therefore not yet decided, the Court of Appeal has provided a helpful perspective for this guidance on consent and confidentiality: namely that a health professional might, particularly in the area of genetics, have a duty to consider the interests of a specific patient's relatives, and that this might in certain circumstances result in a duty to inform a patient's relative about their genetic risk. This would depend heavily on the particular facts of a situation. The Court of Appeal stated that the position of geneticists was different to that of other practitioners, since, by the nature of their work they 'frequently acquire definite, reliable and critical facts of clinical significance about their patients' relatives', and are already required by their professional guidance to consider whether disclosure of such information should be made to family members.

In the meantime, in any particular situation where non-disclosure of relevant information appears to be at stake, and alerting relatives to a familial risk (see section 2.1) is not possible or practical, health professionals need to follow GMC guidance on the matter (see section 2.2.1). You should document how you have weighed in the balance the obligation to respect an individual's confidence with the obligation to communicate potentially clinically relevant information to other family members. Such a balancing exercise will usually include discussion with other members of the healthcare team and be necessary where clinicians are aware of particular relatives who might benefit from knowing about their risk, but are unlikely to hear about it without health professional intervention. It will also include factors such as whether the clinician has sufficient information to contact at-risk relatives. NHS tracing can be very helpful in finding the GP of particular relatives for whom a name and date of birth has been provided, and it is recommended that wherever possible, disclosure is mediated by someone the relative knows.

[†] *ABC v St George's Healthcare NHS Trust and others* [2017] EWCA Civ 336

3 Issues of consent in genomic medicine

Just as confidentiality is a fundamental ethical obligation, so is consent. However, the term ‘consent’ is used in a range of different ways in clinical practice and clinicians may sometimes be uncertain what ‘good’ consent in a particular situation would look like and whether it has been obtained. Consent may indicate an agreement to a procedure or intervention, a legal basis for data processing, or a way of authorising the disclosure of confidential information. In healthcare, the legal basis for data processing (under the General Data Protection Regulation (GDPR) – see Appendix 2.2.1) is usually not consent, but patient consent is valuable for other reasons. In this guidance, we use the term ‘consent’ to describe any or all these scenarios but also attempt to distinguish different aspects.

As a rule, the process of seeking consent ensures that a person understands the nature and purpose of the procedure or intervention thereby asserting a right to self-determination. This section therefore applies to individuals who have capacity and excludes children or adults who lack capacity. Various qualifiers – ‘informed’, ‘valid’, ‘implied’ etc – are often used to describe consent, but it is not always clear what these qualifiers add to the definition of consent which requires three criteria before it is legally valid:

- the person giving consent must have sufficient, appropriate information to be able to make a decision
- they must be competent to make a decision
- consent must be voluntarily given.

Case 1: Enough information to make a decision?



A genomic laboratory hub receives a request to perform Huntington’s disease (HD) genetic testing ‘for reassurance’ in 30-year-old Katy who has a family history of dementia. The laboratory has no record of previous HD testing in Katy’s family, nor any indication that Katy has been counselled on the pros and cons of predictive testing for HD. HD is a serious hereditary condition that currently has no cure, and early death (aged 40–60) is likely.

Key points

- The majority of people who explore predictive testing for HD decide not to have a test once they have had an opportunity to consider the implications in detail.
- From the context of this request, it could be that Katy has not been given enough appropriate information to be able to make an informed decision regarding whether to have a predictive test for HD. It would be appropriate for the laboratory to check with the referring clinician what discussions Katy has had, and to consider whether further expert input from clinical genetics services is needed to support Katy in deciding whether to have this test.
- While the laboratory cannot be held responsible for ensuring appropriate consent has been obtained, it would be entirely appropriate for them to challenge requests if they have reason to doubt whether appropriate information provision has taken place. For example, if the request comes from a clinician who is unlikely to have experience of HD, or as in this case the reason for the request suggests insufficient knowledge.

In much of medical practice, an intervention or treatment may be proposed which directly addresses an ongoing health problem and it may be so integral to their clinical care that the patient’s consent to that intervention or treatment may be inferred. For example, it would be unusual to seek specific

written consent to check a person's haemoglobin or cholesterol level. Inferring consent to a genomic test may be more problematic because such a test may reveal many different types of results, for example current and/or future medical problems, subtle risk information, predictions that require more research before they are certain, as well as information relevant to others.

Hitherto, consent forms in clinical practice have been used to document specific or finite investigations or interventions, for example, written consent to give permission for a specific surgical procedure. In contrast, consent to genomic testing needs to incorporate the complexity and open-endedness of 'results' arising from genomic information, and the ability to reanalyse resultant data over many years. This can be more difficult to capture completely in one form.

Two important challenges have recently emerged to consent in clinical practice. The first concerns the *type and nature of the information that is provided* to patients. A legal case[‡] has confirmed earlier decisions that a patient-centred approach should be used to determine what constitutes 'appropriate' information. The expectations of the 'reasonable patient' *as well as the particular patient*, should guide the professional as to the content and tone of the discussions in any particular case. The healthcare professional must use relevant information for the patient based on their background, values, culture and beliefs while avoiding information overload. This will usually require a discussion with a patient before asking them to sign a form to evidence what has been discussed. It follows that merely obtaining a patient signature without a discussion will be insufficient to constitute valid consent.

The second challenge arises from the *differing contexts for genetic/genomic testing*. Diagnostic genomic tests might directly inform treatment or management, but other genomic tests used for screening or predictive testing might inform future health or the health of another person (such as via preconception or prenatal testing). Germline tests (looking for genetic variants present in all the body's cells, which can be passed on through the generations) potentially reveal information about genetic risks which are not only relevant to the patient but also to their relatives. Somatic tests (looking for genetic variants present in a proportion of the body's cells, such as tests to understand the genetic basis of mutations in a cancer) might inform the diagnosis, treatment and management of an individual patient and may thereby help exclude risks to others.

Another consideration is that the blurred nature of the boundary between clinical care and research in genomics might mean that genomic tests used in a research context will be less clinically useful either because the results themselves, or their interpretation, are more speculative. Furthermore, the governance processes of research and clinical practice mean that there are different expectations about what is involved and how consent is documented. These factors all have a bearing on the process for seeking consent. Documentation of consent complexities will often be part of good clinical practice, but this does not equate to a signature or tick box on a form.

3.1 Elements for discussion

Examples of elements that might be included in a discussion where genomic testing is utilised include:

- Test results may predict future health as well as diagnose current problems.
- Results may be relevant to other family members (consider outlining how communication with family members might be facilitated, and by whom).
- Genomic tests may take longer than other medical tests: patients should be given likely timescales for availability of test results, or components of the results.

[‡] *Montgomery v Lanarkshire Health Board* [2015] UKSC11 1 AC 1430

- The scope and limits of the proposed testing (ie what will, and will not be tested for and communicated, as well as when and how).
- Genomic tests may generate additional, unexpected or incidental findings¹¹ (consider giving examples or outlining how these might be dealt with).
- Outcomes from genomic testing may be uncertain or unclear.
- Interpretation of genomic results may be updated in the future and may need periodic re-evaluation.
- DNA samples are routinely stored (in contrast to most other biosamples which are discarded after the test is complete).
- Stored DNA samples from one family member are routinely used as quality assurance for clinical testing in other family members.
- It is sometimes necessary to share this data more widely across the NHS or occasionally outside it to gather evidence to inform variant interpretation or evaluation of family history;¹² absolute anonymisation may not be possible and might compromise the utility of sharing.

3.2 Incidental, additional, secondary or unexpected information

The potential for discovering ‘other’ information depends on what question (if any) led to testing in the first place, how broad or targeted the genomic analysis is, and what level of interrogation of the genomic sequence takes place. There has been much discussion in recent years about the extent to which findings that may indicate future disease should be sought routinely when a test is requested for a particular reason. Much of the impetus for this discussion has been the recommendation by the American College of Medical Genetics and Genomics (ACMG) that analysis of the sequence of a particular list of genes be mandated when clinical sequencing is undertaken for any purpose.¹³ The justification for this recommendation was that these findings would be ‘clinically actionable’, and detection of pathogenic variants would enable beneficial interventions in the form of screening or treatment.

While this sounds straightforward, there is no uniform definition of clinical actionability. For example, what level of evidence would be required to demonstrate that a particular intervention will be of benefit for those with a particular genetic variant? And how strong should the prediction be before any intervention is offered? There is emerging evidence that opportunistic finding of a genomic variant in the absence of a personal or family history of the associated disease (ie a screening test) will often have a considerably weaker predictive effect, than if found in the context of a family history.^{14,15}

The ACMG approach has been adopted (albeit in a reduced form) in the offer made to participants through the 100,000 Genomes Project to have ‘additional looked-for findings’ made available to them. The 100,000 Genomes Project has adopted this model on the basis that offering these findings during the project provides an opportunity for generating robust epidemiological evidence for its utility and whether it can improve patient care and management. At the time of publication (July 2019), no additional findings have yet been communicated from the 100,000 Genomes Project. An evaluation is planned before considering whether to offer additional findings more widely as part of the NHS Genomic Medicine Service.¹⁶



Case 2: Unexpected future health risks identified via broad genetic testing

Rosie is a 3-year-old girl with short stature, heart problems and a cleft palate. Her paediatrician requests an array-comparative genomic hybridisation (CGH) to investigate her health problems. This finds that Rosie has a deletion encompassing part of *BRCA2*, such that she only has one working copy of the *BRCA2* gene. This has no clinical relevance for Rosie in childhood, and would not explain her short stature, heart problems or cleft palate. However, this *BRCA2* deletion might confer an increased risk of developing breast cancer in adult relatives and some might be eligible for screening and/or risk-reducing surgery (these interventions would be considered in young adulthood at the earliest).

Rosie may have inherited her *BRCA2* deletion from one of her parents – they or their relatives may be at high risk of cancer and might benefit from screening or risk-reducing surgery, but they might not know to access this if the *BRCA2* finding is not communicated. For Rosie, there are no recommended actions until adulthood, yet current NHS systems cannot be relied upon to store this information until it is clinically relevant, or to ensure future communication of her genetic risk at an appropriate time in the future.

Key points

- Broad genetic tests (eg array-CGH or genome sequencing) may reveal unexpected health risks, or information of relevance to other family members. The relevance to other family members may sometimes be more immediate than for the person tested. This possibility should be discussed up front where relevant.
- If a *BRCA2* deletion had been first found in Rosie's parent, current guidance would be that Rosie should *not* be tested for this until she is able to make her own decision regarding testing. However, broad genetic testing sometimes results in generating information outside the referrer's expertise and professionals should be clear about how they can obtain relevant advice if this occurs.
- Different professional duties may arise when responding to existing information than considering whether potential information should be sought.

Another form of unexpected or additional information is where genetic testing reveals a genetic relationship with other people – or absence of one – that was previously unknown or undisclosed.

Case 3: Misattributed paternity



David and Susan are seen in the genetics clinic after their daughter Mary is born with serious health problems. Genetic testing on a sample from Mary finds that she has two variants in a gene associated with a severe autosomal recessive condition. Further testing is needed in order to ensure that these variants were inherited on separate chromosomes (one from each parent), as this would confirm that Mary had no working copy of the relevant gene, meaning that the true cause of her health problems has been found. Tests on the parental samples show that Susan has one of the variants, but David has neither. Further testing to clarify this shows that David is not the biological father of Mary.

David and Susan had previously been told that, as a couple, the chance of their future babies being affected by the recessive condition was likely to be 25% or 1 in 4. They were told that if a genetic cause for Mary's health problems was found, they could have prenatal genetic testing in future pregnancies (though this would have an associated miscarriage risk). However, as David is not the biological father of Mary, the chance of him and Susan having a baby with the autosomal recessive condition would be very low, and prenatal genetic testing would not be indicated. Different professional duties may arise when responding to existing information than considering whether potential information should be sought.

Key points

- Genetic testing can reveal unexpected social information as well as medical information; ideally this possibility should be made clear during the consent process, although the presence or absence of consent will not necessarily help to determine whether, when or how such a finding should be disclosed.
- While a clinician may feel uncomfortable introducing this type of 'social' information into discussions, it can have medical relevance, for example in predicting recurrence risk for future pregnancies.
- Clinicians should consider that trio testing (often recommended by a laboratory, or a prerequisite of research study recruitment) may reveal such information.¹⁷

3.3 Variants of uncertain/unknown significance

More extensive use of genomic sequencing is rapidly increasing the volume of findings that are variants of uncertain/unknown significance. Whole genome sequencing of an individual will reveal approximately 4–5 million variants, of which approximately 100,000 are rare variants. Some of these may clearly disrupt gene function but for others the evidence that the clinical symptoms or phenotype in question can be explained by them is either absent or inconclusive. Although recent laboratory guidelines on the interpretation of variants are helpful, much variant interpretation will also require clinical input to see whether a phenotype tracks with a variant in a family or population, which in turn requires resources, involvement of family members, as well as time for (inter)national data gathering ventures to collate enough evidence.

Although uncertainty has always been part of genetics, different types of uncertainty arise from the use of genomic approaches:

- Some variants have uncertain significance because insufficient evidence exists for their classification (they may simply be normal genetic variation but not seen frequently enough in the general population to be confident of this).

- Other variants are clearly associated with a disease or condition, but their individual contribution is not sufficient to be usefully predictive or diagnostic. They may need, for example, the presence of other variants or particular lifestyle factors before they confer risk and mapping such multifactorial risks to disease has been more difficult to translate to clinical utility.¹⁴

Care should be taken not to conflate these different types of uncertainty as their routes to certainty are different. Since the public discourse around genomics often presents its outcomes as rather clear-cut, this can be an important element to introduce into consent discussions as the types of uncertainty may come as a surprise to some.

Case 4: Evolving variant interpretation



A particular variant in the *BRCA1* gene was thought for many years to confer a high risk of breast and ovarian cancer. Adult women with the variant were offered screening and risk-reducing surgery and were encouraged to inform their relatives that they may wish to consider predictive genetic testing. More recently, through international efforts and database linkages of family history details and inheritance of the variant, evidence suggests that it is not associated with disease – a benign variant. Although women with the variant have previously been advised that they are at high risk of developing breast and ovarian cancer, they, their relatives, and future people with the variant, can now receive more up-to-date clinical advice.

Key points

- Genetic test interpretation may change (in either direction) over time in light of new evidence, and consent conversations should discuss this.
- The evolving nature of variant interpretation raises questions as to how to inform patients that the interpretation of their historical genetic test has changed – patients should be made aware of this possibility and encouraged to seek updated advice where relevant.
- International collaboration and deposition of genomic data in databases is important in improving variant interpretation, and where relevant the consent process should make patients aware of this.

3.4 Recontact or new forms of ongoing contact

Since genomic knowledge is rapidly evolving, it is likely that interpretation of some results will change over time: variants of uncertain significance might be confirmed as disease-causing in the future. Similarly, variants that are thought to be disease-causing might be found to have no, or reduced, impact on disease. However, there are currently few systemised or comprehensive mechanisms for updating findings. This is an issue, because in other areas of medicine the test would simply be repeated. In genomics, the data stays the same, but the interpretation may vary over time and there may therefore be an expectation that former patients would be told if new evidence about their findings comes to light. As genomics becomes integrated into routine clinical practice and in the absence of systematic mechanisms for updating findings, health professionals and patients may need to share the responsibility for ensuring that updated information is sought/communicated. It will be vitally important for health professionals to discuss the dynamic nature of genomic test results, invite recontact where appropriate, and indicate that it may happen as new evidence arrives.¹⁸

As practice evolves, health professionals should be clear about what is possible for the service to deliver. They should manage the expectations of patients for recontact and retesting, and may need to differentiate between historic tests and prospective genomic tests. While it may be important to

make patients aware that they may be contacted in the future if the interpretation of their genetic findings change, it is important not to create an expectation that this will happen automatically if there are not reliable systems in place to support this.

Case 5: Progression of interpretation



Nisha was diagnosed with hypertrophic cardiomyopathy in her twenties. Her father had died suddenly and was shown to have hypertrophic cardiomyopathy on post-mortem. Nisha had a genetic test to try to establish the precise genetic cause of her hypertrophic cardiomyopathy, as she wanted to help her children and wider family establish their risks of developing the condition. The lab processing her sample found that she had a variant of uncertain significance in *MYBPC3*, a gene associated with hypertrophic cardiomyopathy. The lab was not confident enough that the variant was really the cause of Nisha's hypertrophic cardiomyopathy to use it for predictive testing, so Nisha's relatives started clinical screening for the condition based on their family history.

Five years later, the lab detects the *MYBPC3* variant that was found in Nisha in another person with hypertrophic cardiomyopathy. The lab does an updated review of the evidence regarding the variant and finds that it is now thought to clearly play a part in the disease. They reissue Nisha's genetic report with the updated classification.

Key points

- Variant interpretation may change in light of new evidence – depositing genomic variants and their clinical context in databases is an important driver of this progress, and this should be made clear in the consent process.
- Currently, variant re-evaluation tends to happen in an opportunistic and ad hoc way. Where relevant, consent conversations should encompass the possibility that a patient will be recontacted in the future with updated information but should take care not to imply that this will automatically happen unless there is a clear mechanism in place to facilitate this.
- Patients with uncertain genetic findings should be encouraged to recontact clinical genetics periodically for an updated interpretation.
- However, we recognise that specific recontact triggered by reinterpretation would be a more consistent approach and hope that this will be technically and logistically feasible in the near future.

3.5 Special considerations for those who lack capacity to consent

3.5.1 Children

Children will often not have the capacity to provide consent and so this will then be requested from a parent (or person with parental responsibility). Although those under 16 are presumed not to have capacity, adolescents (aged 14 or 15 for example) may be assessed as being competent to decide for themselves (Gillick capacity[§]) and thus provide consent. Babies or infants are never competent to consent to genomic testing. Here, where results will inform their immediate diagnosis, treatment or surveillance it will usually be in their best interests to have such testing. However, genomic testing may also reveal non-immediate diagnoses or predispositions to disease in the future, raising questions about how and when these findings should be dealt with. For example, if testing is to predict health problems as an adult, then testing should usually only be offered if there are

[§] *Gillick v West Norfolk and Wisbech AHA* [1986] AC 112

interventions that can be offered before that time to ameliorate the course of the condition in question. However, whole genome sequencing may generate information about adult onset conditions or carrier status for recessive conditions that are not directly relevant to the child's care or may not benefit the child for some time.

Once that information is in existence, this raises different questions about how much it should be interrogated and disclosed to parents, compared with those raised if the test is deferred (as many guidelines on childhood testing have recommended over the past 25 years). There is an ongoing debate about whether an active search should be made for variants that have no bearing on the health of the child, because they might help detect actionable variants in adults, a parent for example (see section 3.2). Pending more specific guidance for children (forthcoming)¹⁹ we recommend using the best interest of the child as the primary reason for undertaking predictive genetic tests, or disclosing predictive results from existing data sets. The potential impact on the health of a parent or other relative should not be the primary justification for undertaking or disclosing such tests. These are no easy decisions, indeed it might be argued that it would be in a child's best interest to facilitate appropriate screening/testing of their parents. However, where such testing is not offered as part of a population screening programme, caution should be used about revealing results in children that have no bearing on their medical management during childhood.

Young people aged 16 or 17 are presumed to have capacity to consent for themselves.

Case 6: Testing children for future-relevant information



Richard and Elaine have recently had a baby who was tested for cystic fibrosis via the newborn screening programme and was found to be a carrier for cystic fibrosis. The couple now request carrier testing of their older daughter aged 6, who is healthy. Knowing the carrier status of the 6-year-old would not affect her medical care at all. It may be relevant to her when she reaches reproductive age, as if she is a carrier then she may have a chance of having children with cystic fibrosis (if her future partner is also a carrier for cystic fibrosis).

The purpose of the newborn screening programme is to identify babies with cystic fibrosis so that they can have early treatment, aiming to improve prognosis, not to identify babies who are carriers of the condition. Discovery of carrier status is an incidental finding in a small proportion of families.

Key points

- Testing the 6-year-old for cystic fibrosis carrier status has no medical benefit for the child, and current professional guidance is that testing should be deferred until the child is old enough to make her own decision.
- Testing children for genetic variants that would only be of relevance to them once they are adults is usually considered beyond the remit of parental consent.
- Just because one child has been tested in one context, does not justify testing other children on grounds of consistency. Carrier results might be revealed as a by-product of a screening programme and there is no clinical indication to search for them in another setting.
- However, it is often more helpful to reframe parents' requests as discussions about the optimal time for testing, to give parents the time to consider why they are asking for a test, rather than declining tests on the basis that guidelines prohibit such testing.

3.5.2 Looked after children

As outlined above, determining what constitutes ‘the best interests of the child’ is not always straightforward. For example, some professionals involved in the placement of looked after children may regard genetic/genomic testing as being in the child’s best interests because they think it would inform their placement (adoption or otherwise). This is unlikely to be the case and genomic testing should generally not be performed if it would not be done but for their looked after status. If there are no medical consequences to testing, the child’s right to make an autonomous decision for themselves in the future should be preserved. Such testing is as likely to jeopardise a potential placement as to facilitate it.²⁰

3.5.3 Adults lacking capacity

Adults who lack capacity are unable to consent to genomic testing. Therefore, testing will usually only be done on the basis of the adult’s best interests. Often making a diagnosis will be in a person’s best interests as it will be an action taken ‘to preserve the life, health or wellbeing’ of a patient. A best interests assessment will usually also seek the person’s past and present wishes and thoughts from carers or others interested in the person’s welfare.²¹ In making this judgement, it should not be assumed that the person lacking capacity would have refused consent.

Similar challenges might arise in adults lacking capacity as with the testing of children, where the main motivation for genomic testing might be to inform diagnosis or treatment in other family members rather than inform that adult’s diagnosis, treatment or management. There is legal precedent for considering that testing with the sole aim of benefiting relatives might still be in the best interests of an adult without capacity.

Case 7: Testing to inform the care of other family members

Jenny is a 44-year-old woman with severe learning difficulties who lives in a care home. She was diagnosed with dilated cardiomyopathy (DCM) in her thirties and is taking lots of medications. Her sister Daphne recently attended the genetics clinic concerned about her own risks of developing heart problems. Jenny and Daphne have a strong family history of cardiac-related deaths at young ages, and their father had DCM based on his post-mortem details. In order to offer a meaningful predictive genetic test to Daphne, a diagnostic test is needed in a living affected relative (this would aim to establish the exact genetic cause of DCM in the family, so the lab could then test to see whether Daphne had inherited this genetic predisposition). Jenny is the only living affected relative, but she does not have capacity to decide whether to have a diagnostic genetic test.

Key points

- As Jenny lacks capacity, decisions about testing should be made based on her best interests. A narrow view might conclude that testing Jenny is not in her best interests, as establishing the genetic cause of her DCM is unlikely to alter her clinical care. A wider view would acknowledge that Jenny’s best interests may be served by helping her sister Daphne through Jenny having a test. The discomfort of the test and any distress that it might cause Jenny would have to be considered.
- It should not be assumed that just because Jenny does not have the capacity to consent to genetic testing, that testing for the benefit of her sister is not permitted. However, multidisciplinary team discussions are recommended in such circumstances.

3.6 Consent at the interface of research and clinical practice

Although the boundary between research and clinical care is not distinct in many clinical specialities, in genomics the overlap between research and clinical domains is particularly significant. This has resulted in various initiatives to explore a hybrid consent model: in practice these range from a truly integrated tool that straddles research and clinical applications through to an approach which allows systematic use of research findings to deliver clinical benefits. The 100,000 Genomes Project developed a consent model whereby clinical testing was only possible if participants also agreed to take part in research. While consent to both clinical practice and research makes sense where the two activities are not distinguishable, especially to the patient whose consent is sought, any such approach must also be compatible with the different regulatory frameworks which govern clinical and research activities.

Case 8: Unforeseen future options



Joseph is seen in the genetics clinic with severe developmental delay and unusual physical features. He was conceived using an egg from an anonymous donor. Standard NHS genetic tests cannot find an explanation for his health problems but finding a genetic diagnosis could improve his clinical care and give his family guidance as to what to expect for his future development.

Further testing would be available to Joseph via a hybrid clinical/research project, which aims to find diagnoses for children affected by developmental disorders by comparing their genetic code with that of their biological parents (trio testing). Samples from Joseph and his biological father are readily available. The fertility clinic that facilitated the egg donation is asked whether they would approach the egg donor to see whether she would consider participating in genetic testing to help find a diagnosis for Joseph.

Key points

- Genetic testing often involves people beyond the person affected by a suspected genetic condition (classically the parents of an unwell child).
- The boundary between clinical testing and research testing is frequently blurred in genetics – often ‘research testing’ is the only avenue left to reach a clinical diagnosis.
- Emerging technologies such as egg donation and trio genome testing are opening up new questions that may not have been considered at the point of initial consent conversations.
- It is unrealistic to expect historical consent forms to cover all possible future eventualities in the context of rapidly evolving technology such as genome sequencing – often consent may be more appropriately seen as an ongoing conversation that needs updating and clarifying where necessary, rather than as a single historical event that cannot be revisited.

3.7 Use of patient data for variant interpretation and quality assurance

Delivering high-quality clinical care relies on accessing and integrating multiple sources of data. Where genetic and genomic tests are used for diagnosis or management, this includes accessing relevant data about the patient (phenotypic data including clinical examination, family history and other diagnostic tests including imaging). In many cases this will also include comparing the results from an individual’s test with a set of individuals who are known to have the disease. In the context of rare diseases, this may require other professionals to access and use this data to deliver a safe and accurate diagnosis.

The creation of a centralised genome medicine service means that there is an expectation that data from other patients being treated within the NHS will be accessible by clinicians and scientists to inform patient care. This is pivotal when undertaking the interpretation of genetic variants, for example, determining whether a rare variant is significant is only possible by comparison with the same or similar variants found in other people. Data ‘sharing’^{**} is also important for quality assurance.

Important changes to the way these data are governed will impact upon how health professionals are able to access and use data. Health professionals need to be aware of these changes to understand how they can act in ways that are ethical and comply with the law (see Appendix 2).

Case 9: ‘I want my data’



Meena was referred to the genetics clinic after she developed breast cancer in her forties. She was offered *BRCA* testing but this did not find any disease-causing variants. Meena remained very worried that the *BRCA* test must have missed something and asked to be given the ‘raw data’ from her test so that she could investigate it herself using online interpretation programmes and/or private companies. The genetics clinic offered her a further appointment to discuss this, but she did not attend, and subsequently wrote to the genetics lab demanding that they send ‘all the data’ from her previous genetic testing.

Key points

- Genetic testing can create many different kinds of data (the stored DNA sample itself, files from early on in sequencing processes, files of computer-identified variants, scientist-curated files of variants thought to be potentially relevant to the clinical reason for testing, formal reports documenting the outcome of genomic tests etc).
- Data use and processing is governed by legislation such as GDPR. Under the GDPR, Meena’s right to access these data depends on a variety of issues: whether the data is identifiable (ie whether it can be linked to her), the benefits and harms of disclosure, and how feasible it might be to extract her data from aggregated data.
- However, genetic testing involves processes being applied to patient data such that genetic laboratories may also be considered to be co-creators of the data and may have additional rights over it. Attempting to clarify ‘who owns what data’ becomes unhelpful and would not necessarily help to define what should be done about requests like this.
- There may be significant resource implications in fulfilling such requests, including scientist time taken to locate relevant data, and equipment costs for data storage and processing.
- Online interpretation services for genetic data often involve an extremely cursory consent process, and ‘results’ from such services may be of much lower quality than those from NHS laboratories. Discussing these issues further with Meena may mean that she no longer wishes to request this data; however, the situation is made more complex here by Meena’s reluctance to further engage with clinical genetics services.
- In this particular case, the arguments for not releasing the raw data to Meena seem to outweigh the potential benefits of disclosing these data. Multidisciplinary discussion and/or ethical support such as a clinical ethics committee may be helpful in coming to, and documenting, a final decision.

^{**} The term data ‘sharing’ is sometimes interpreted as a much broader concept than we intend here. Here we mean the comparison of genomic data with other large data sets (inter)nationally to inform patient care. This type of data sharing may also include running queries or interrogating data rather than moving it. This comparison is not as necessary for other NHS test results.

3.8 Use of samples and data for purposes other than clinical care and research including audit, education and training

Recent reforms to data processing laws require that the use of personal (identifiable) data is minimised unless it is necessary for healthcare or medical research or for public health purposes. In contrast, anonymised data, ie data that cannot reasonably be linked to a particular patient, can be used more freely. But what constitutes ‘reasonably’ here is not yet clear: much genomic data could with a lot of effort be linked back to a particular person, but at the same time appear anonymised if for example it is depersonalised (identifiers are removed). The onus is on the health professional to minimise the personal data that is used for audit, education or training and to deidentify data (such as photos or combinations of clinical details) as much as they can (see Appendix 2).

Different rules apply to the use of samples of blood or tissue which are subsequently used for audit, education and training. In England and Wales, these are regulated under the Human Tissue Act 2004,²² and may require consent to be used for these purposes depending on whether the samples are taken before death (in which case consent is not required) or after death. In Scotland these uses are regulated by the Human Tissue (Scotland) Act 2006.²³ This topic was discussed in more detail in Appendix A1 in the second edition of this guidance (reproduced in Appendix 3 for ease of reference).²⁴

3.9 Use of data for commercial purposes

Understanding how genomics contributes to ill health and disease underpins good clinical care. Therefore the new genomic medicine service relies upon more effective utilisation of patient data across the NHS, and where appropriate, comparison with other datasets outside the NHS, to better understand the significance of genomic variation. Researchers have an interest in accessing genomic data for research on the links between genes and disease, and on a population scale to understand the natural history of disease. Commercial companies use data to develop drugs, inform insurance offers, and for a wide range of medical and non-medical purposes.

Commercial companies undertaking research will usually seek specific consent from participants to access raw whole genome data for research purposes. In the 100,000 Genomes Project for example, commercial companies have been actively encouraged to join research collaborations and participants have been explicitly asked to consent to their data being accessed by researchers from the for-profit industry. While consent to data sharing is important to build trust about how genomic data is used, it does not need to ‘do all the work’: robust governance and data security are also important (see Appendix 2).

3.10 Genetic data and insurance companies

Since some genetic data can be used to predict future disease, it is potentially useful for the insurance industry. For this reason, the Association of British Insurers and the government have agreed that insurers cannot request the result of a predictive genetic test (or that such a test is done) to determine insurance cover. The exception to this is where the predictive test is for Huntington’s disease for cover exceeding £500,000. This voluntary code on genetic testing does not cover diagnostic testing, or family history information. It does however cover predictive genetic testing that is done exclusively for the purpose of research. Health professionals should take care not to disclose predictive genetic test results to insurance companies.²⁵

3.11 International data sharing

Genomic databases need to reflect the genetic diversity of patients across the world for their value to be maximised. For example, a rare variant in an African population might be common in a European one and vice versa. Given the diversity of ancestry across populations, it is vital that the databases that clinical scientists use reflect the diversity of the patients they are testing. This often necessitates accessing and consulting databases outside of the genomic medicine service where testing is happening. Sometimes the rarity or complexity of a disease might require DNA databases to be accessed from across the world. If the purpose of data sharing is to interpret a variant that is directly implicated in a patient's disease for clinical purposes, specific consent to data sharing is less likely to be a prerequisite. However, where the access is for research and the benefits to the patient are likely to be more speculative, it might be necessary to obtain a specific consent from the patient to share their data. Initiatives such as the Global Alliance for Genomics and Health use a human rights framework to facilitate responsible genomic data sharing around the world.

3.12 Clinical photography / video recording

Photographs and videos have often been recorded in the medical records of patients as a means of documenting and understanding the patient's condition. Integration of genomic data, photographic images and clinical data increases the chances of patients being identified. Before taking a photograph or image, the purpose and possible uses of the photographs and film must be explained to the person (or parent) and a record made of the discussion. Where photographs/images are shared outside clinical care (eg for research, lectures or presentations) images should be anonymised through using composite imaging systems (eg Decipher) or specific consent should be obtained for use. For a proposed record of photography form see Appendix 1.3.

4 Sharing of genomic information with others

There are a number of reasons for sharing genomic information. One reason might be to confirm whether a genetic variant is disease-causing or to understand how much it contributes to a condition. Family history of disease and information about affected individuals within or outside a family may be useful in understanding the causes and nature of a disease.

However, information about an individual's disease might also be relevant to their family members who are at risk of developing disease in the future. The closer the biological relationship between the patient and an individual, the more likely it is that this information might be informative. When weighing up whether or not to share such information with relatives who are potentially at risk or their health professionals, the practitioner should take account of the confidential nature of the relationship between the health professional and their patient, as well as any consent that has been given by the patient. The principle that health professionals should recognise the value of solidarity and altruism is reiterated in recent guidance from the chief medical officer for England.²⁶ This is discussed in more detail below.

4.1 Sharing genomic information with relatives

Once a genetic diagnosis is made, health professionals will often ask an individual to share their genetic results with the relatives for whom it may be relevant. Genetic health professionals / genomic medicine services often offer help with this process of cascading information and may provide letters or information leaflets to be passed on. In some cases, however, relevant communication does not happen, and more tailored support may be necessary. Indeed, studies suggest that significant proportions of the relatives identified by health professionals as requiring information do not find out about their heritable risk. Health professionals should routinely discuss with patients the importance of family communication about genetic findings and help them to identify the relatives that need that information. During this discussion, health professionals might identify particular patients who have difficulty in sharing their results with certain relatives and offer them targeted support. It is worth noting that both the finding of a genetic explanation (positive result) and the absence of it (negative test result) may have implications for relatives' risk assessment. Outright refusal to share relevant information with at-risk relatives appears to be rare, but where it happens can result in a lot of clinical time being utilised to decide whether other means of disclosure are warranted. See sections 2.1 and 4.3 for more detail of approaches to consider in order to alert at-risk relatives, including whether and when it might be appropriate to communicate genomic information without the consent of the person in whom it was first identified.

Case 10: Struggles in sharing information



Saleem is a 41-year-old man with Lynch syndrome (a cancer predisposition syndrome that increases the risk of bowel and various other cancers). He is very ill with advanced colorectal cancer. Saleem has several siblings with whom he is not in regular contact. He provided their details when giving his family history but is reluctant to tell his siblings about his diagnosis of Lynch syndrome. He does not appear to be withholding this information maliciously, but because of the lack of contact, he finds it difficult to approach them. The clinical genetics department has offered Saleem help to make contact with his siblings, but Saleem is adamant that he will do this, he would just like to 'get over his treatment first'.

Key points

- Many patients acknowledge the need to inform their family members about genetic risks but some find it difficult to do so.
- Consent conversations need to make it explicit that genetic tests may generate information of relevance to family members. It may be helpful to encourage patients to discuss their intention to have genetic testing with their family, in advance of receiving the results.
- Clinicians are often left in a difficult situation when a patient intends to disclose information about a genetic risk but is struggling to do so. Offering support such as written information to pass onto relatives, relevant online resources, or liaison with relatives' GPs may be appropriate.

Case 11: 'Get yourself tested'



Clare is a 22-year-old woman who has been referred to clinical genetics because of a recent diagnosis of Duchenne muscular dystrophy in her nephew. Her sister Natalie was found to be a carrier for the condition and has told Clare to 'get herself tested' for Duchenne muscular dystrophy before she has children. Clare's genetics service writes to the laboratory where Natalie and her son were tested to ask for details of the exact disease-causing variant in the family. The laboratory refuses to release this information until they have evidence that Natalie has consented to this.

Key points

- While it is possible to recontact Natalie and obtain her signature, good consenting practices would ensure that such uses of Natalie's sample and genetic information would have been discussed with her at the time of testing, her agreement documented, and that any explicit dissent on her part would have been both recorded and notified to the laboratory. If good practice had been followed, then the laboratory would not need to request further evidence of consent and the delays imposed by the additional bureaucracy could be avoided.
- Even if Natalie had explicitly dissented, Natalie seems to have changed her mind since by speaking to her sister. Natalie has clearly indicated that she wishes her sister to be aware of her family history of Duchenne muscular dystrophy, and it would seem disproportionate to expect Natalie to explicitly consent to the details of her disease-causing variant being released.

4.2 Using family history and information from other family members as an aid to diagnosis

Detailed knowledge of a family history of a disease, condition or symptom helps to clarify how the disease might be inherited and allows estimations of its expressivity and penetrance. Clinical genetic / genomic medicine services often use clinical information from a three- or four-generation family tree with identifying names, ages, deaths and illnesses to inform such estimates and therefore plan clinical care. Where a family history of a condition is unclear or uncertain, health professionals may want to confirm key diagnoses in family members who are not their patients through hospital, cancer registries and other records to more accurately ascertain risks of developing disease, and make or confirm a diagnosis or the likely mode of inheritance. Knowing the exact mutation found in a relative may allow more accurate testing, and better follow up and management for the patient and their relatives. Thus, technical information and laboratory reports should be appropriately shared between the different laboratories undertaking the testing and be available to clinical staff providing care to patients and their relatives.

It is good practice to record any discussions about how genetic results from the patient may impact on the care of family members (see Appendix 1.2). Where a patient informs relatives, and a relative then approaches a service for advice, this suggests permission for clinicians to access relevant molecular reports to clarify the mutation found. Asking for a further verification of consent before the release of such information is usually unnecessary.

Case 12: Familial genomic information needed to develop a meaningful predictive test

Jamila is referred to a genetics service by her GP as she is concerned about her family history of breast cancer. She is not aware of any family members who have sought genetic advice or had genetic testing. Jamila provides her family history, and the genetic healthcare professional realises that Jamila's cousin Laila was previously seen by the genetics service and found to have a disease-causing *BRCA1* variant, though this information has not been shared with Jamila. Predictive genetic testing for Jamila would be more informative if the exact disease-causing variant found in Laila could be disclosed to the laboratory undertaking Jamila's test.

Key points

- Ideally, Laila's consent conversations for having a genetic test should have included that her results may have implications for family members and may be used to inform the testing or care of family members (see section 2.1, and these conversations could be formally recorded using the 'record of discussions' form in Appendix 1.2).
- The finding of a disease-causing *BRCA1* variant in Jamila's and Laila's family could be considered confidential to the family, rather than confidential to the family member in whom it was first identified. As such it would be appropriate for the clinician to share the molecular details of the *BRCA1* variant found in the family, without identifying Laila as the person in whom it was found.
- The clinical consequences of having a disease-causing *BRCA1* variant (for example a diagnosis of breast or ovarian cancer) are confidential to Laila alone. The clinician should not disclose that Laila was the person in whom the *BRCA1* variant was first identified; however, the fact that it may be possible for Jamila to correctly infer this should not necessarily prevent disclosure.

Case 13: A family history made less meaningful by redaction



John is a 38-year-old man with colorectal cancer. He tells the clinical geneticist who sees him that his mother and aunt have had womb cancers, and that both have died. The geneticist writes to the pathology departments where his relatives were treated for confirmation, since this would increase the chances of Lynch syndrome in this family. The pathology department sends copies of histology on both women (one was in fact cervical, the other endometrial) but the reports are anonymised (black line through identifying details) because of concerns about breaching the Data Protection Act.

Key points

- In this case, sending the unredacted histology reports could have helped the healthcare professionals treating John to determine what the likely genetic aetiology is.
- Hospital departments should share family history information with genetic services in the expectation this will be kept confidential – sharing such information where necessary to inform the clinical care of another family member is appropriate.
- Redaction of pathology reports is not necessary and is likely to obstruct good clinical care.

Case 14: Early pregnancy with a chance of a serious genetic condition



Caroline is seen in the genetics clinic when she is 10 weeks pregnant. Multiple boys in her family have died young due to an X-linked condition (ie one in which males, with a single X chromosome, are affected but females, with two X chromosomes, are usually unaffected because they only carry one copy of the altered gene and have a normal copy on their other X chromosome). Caroline does not know which of her relatives have had genetic testing. Caroline currently does not want anyone in her family to know about her pregnancy, as if she knew that she was pregnant with a boy with the X-linked condition she would plan to have a termination of pregnancy, and she thinks that her family would not support this. However, in order to provide an accurate carrier test and potentially a prenatal test to Caroline, the genetics service would need to access the exact details of the disease-causing X-linked variant in an affected relative of Caroline.

Key points

- The public interest in keeping Caroline's pregnancy confidential (and in maintaining trust between patient and physician) may be more important than the requirement for consent to the disclosure of a test result from a family member. However, there is also a clear public interest in maintaining a confidential health service in which people are not deterred from having genetic testing by concerns that their confidential information might be disclosed.
- Consent conversations for genetic testing should ideally encompass the issue that results may be used to inform the care of other family members, and this discussion should be documented at the time of testing.
- It may be appropriate to view the details of the X-linked variant as being confidential on a familial level, such that this information could be used to allow Caroline's carrier testing. The personal details of the relative(s) in whom the X-linked variant has been identified should not be disclosed to Caroline.

4.3 Where consent to release information has been refused

Outright refusal to share relevant genetic information with relatives is uncommon in clinical genetic practice (although also difficult to measure accurately), probably because many individuals attend (at least in part) in order to help their relatives. As genetic testing is used more routinely in mainstream practice, perhaps to guide particular treatments, relatives' interests may be less apparent, and consideration of familial disclosure may need to be made more explicit. Where it does occur, it is important to weigh up the harms of breaching confidentiality with the potential benefits of doing so (and to document this balancing process clearly in the patient's medical records). Professional and ethical guidance including the NHS Code of Practice on Confidentiality²⁷ and from the General Medical Council (GMC)¹⁰ reaffirm that the rule of confidentiality is not absolute. In certain circumstances it may be justified to break confidence where the avoidance of harm by the disclosure outweighs the patient's claim to confidentiality. This principle has been reiterated in a recent legal case^{††} in which the Court of Appeal stated that it may have been potentially justifiable for a health professional to breach the confidentiality of their patient in order to benefit others.

Before breaching any confidence in which the patient has refused consent to release relevant information, a practitioner should generally:

Either

(1) Consider whether breach of confidence is necessary. For example, can relevant risks be communicated without revealing the identity of the individual in which they were first discovered? (see section 2.1)

Or

(2) If breach of confidence is necessary:

- i. Attempt to obtain consent to disclosure from the patient.*
- ii. If it is not possible to obtain consent from the patient:*
 - (a) Discuss the case with experienced professional colleagues (eg hospital clinical ethics committee, Genethics forum).*
 - (b) Tell the patient that you intend to breach this confidence and why.*
 - (c) Contact a relative where it is practical and reasonable to do so.*
 - (d) Keep any disclosure to the minimum that is strictly necessary for the communication of risk.*
 - (e) Record the balancing act undertaken and justification for breaching confidence.*

GMC guidance on confidentiality states that in general, if you are going to breach someone's confidence you should 'tell the patient about your intention to disclose personal information'. When it comes to genetic information, the GMC also states that if practicable: 'you should not disclose the patient's identity in contacting and advising others about the risks they face'.¹⁰

^{††} *ABC v St George's Healthcare NHS Trust and others* [2017] EWCA Civ 336

Case 15: A 50:50 chance of inheriting Huntington's disease



Henry has recently received a diagnosis of Huntington's disease. This serious hereditary condition has no cure and early death (aged 40–60) is likely. Henry's daughter, Jane, knows that her father is ill, but not that his condition is heritable. She is pregnant and mentions this to Henry's clinicians. They wonder whether Jane has a right to know that she has a 1 in 2 or 50:50 chance of developing Huntington's disease (which may have significant implications for her own health and reproductive choices). Henry refuses consent for Jane to be told his diagnosis, as he is worried that she might terminate her pregnancy.

Key points

- Here, clinicians need to balance the harms of potentially disclosing Henry's diagnosis against his wishes, with the benefits to Jane of having access to information about her potential risk of developing Huntington's disease.
- The decision of whether to disclose this information to Jane is challenging and should be discussed with experienced colleagues. The balancing act involved in reaching a decision should be clearly documented in the medical notes.
- The genetic risk of Huntington's disease can be considered as familial information rather than information that is confidential to Henry.
- If clinicians decide to disclose the information to Jane, this should be done in a way that protects Henry's confidentiality as far as possible, for example making Jane aware that she may be at risk of developing Huntington's disease and that testing is available, without disclosing information such as the details of Henry's clinical history and date of diagnosis. However, the fact that Jane may correctly deduce these more personal details about Henry should not necessarily prevent disclosure of the genetic information.
- A similar case is currently being discussed in the courts.^{‡‡} Although this has not yet been concluded, the Court of Appeal has already stated that, depending on the circumstances of the case, clinicians may have a duty to consider the interests of at-risk relatives (see section 2.2.2).

^{‡‡} *ABC v St George's Healthcare NHS Trust and others* [2017] EWCA Civ 336

Case 16: Relative at risk of cancer



Josef was diagnosed with Lynch syndrome (a genetic predisposition to bowel and various other cancers) after developing bowel cancer in his thirties. He is estranged from his siblings and does not want to contact them to inform them that they may be at risk of Lynch syndrome. He is also unwilling for his doctor to do this, as he is sure that his siblings will work out that the information must have come from him, and he does not want them to know about his bowel cancer.

From the family history that Josef provided, his clinical genetics healthcare professionals know that one of Josef's sisters, Maria, has also had bowel cancer and is therefore also likely to have Lynch syndrome. If so, Maria would be at increased risk of developing other cancers, for example, endometrial cancer and so might benefit from a risk-reducing hysterectomy. The heritable aspect of the cancer is insufficiently common to be certain that Maria will herself have been tested for Lynch syndrome, and so the question of alerting her of this familial tendency is considered.

Key points

- Here the wishes of Josef to keep his diagnosis of Lynch syndrome private must be balanced against the benefits to his wider family of making them aware of a potential inherited predisposition to cancer (allowing them to access bowel screening and interventions such as risk-reducing hysterectomy).
- The detection of Lynch syndrome in the family can be regarded as confidential on a familial level rather than information that uniquely identifies Josef. However, disclosure of this information may lead Josef's siblings to conclude that Josef must have had cancer. Where possible, the information should be disclosed in such a way as to reduce the chance that the familial genetic information is seen to have come from Josef. For example, NHS tracing could be used to contact Maria's GP to recommend that she is referred to a genomics service to investigate a possible genetic predisposition to cancer without revealing the source of that information.
- If genetic information is disclosed against Josef's wishes, this should be explained to him, along with the reassurance that any disclosure would be kept to the minimum necessary to communicate the potential risk of cancer in other people in his genetic family.

5 Emerging issues for clinical practice

The use of whole genome sequencing allows a new paradigm for patient testing and management in which the results from genomic tests directly inform patient care, sometimes in the absence of clinical symptoms. This new way of working may change the relationship between healthcare professionals and their patients and creates additional responsibilities for both health professionals and patients.

5.1 Increased clinician- or patient-initiated recontact

In the future, whole genome sequences are more likely to be used as a resource which is interrogated in different ways at different times, prompted by different clinical questions (instead of repeat testing which is the more usual practice in healthcare). This will allow for relevant information to be divulged at relevant times but will require significant changes to record keeping. For example, the recording of future risks that will require assessment or surveillance at some point. Health professionals will also need to be able to deal with requests from patients for updates in the interpretation of data from tests done many years before and will need to understand what their responsibilities are for retesting and referral to other healthcare services (see also 3.6). Currently re-evaluation and recontact happens on an ad hoc basis, and it will be important to assess whether techniques and sensitivity of a test has advanced significantly and to see whether there are clinical justifications for repeating a test. This will need to balance the needs of past patients with existing and future patients who might need genetic testing and utilise limited NHS resources as fairly as possible. This is a rapidly evolving picture as more and more genomic data is stored on an exponentially increasing patient population for which more specific guidance will undoubtedly be forthcoming.

5.2 Building an evidence base through a genomic medicine service

5.2.1 Access to genotypic and phenotypic information

Delivering high-quality clinical care relies on accessing and integrating multiple sources of data. Where genetic and genomic tests are used for diagnosis or management, this includes accessing relevant data about the patient (phenotypic data including clinical examination, other tests including imaging, pathology reports, family history and other diagnostic tests). This may require other professionals to access and use this data, often in multidisciplinary teams, to deliver safe accurate variant interpretation and diagnosis, and to guide ongoing treatment and management.

Case 17: Access to family pathology reports needed to inform clinical care; misunderstanding the GDPR



George is seen in the genetics clinic concerned about his risk of cancer. Several of his relatives have died of cancer at a young age. His half-brother and cousin both died in their thirties and George remembers being told that they both had bowel polyps. The genetics department seeing George requests histology information from these two relatives. The histology department are not willing to search for or provide the histology information from the relatives as they are concerned that this would be in contravention of GDPR. They ask the genetics department to obtain written consent from the next-of-kin of each deceased relative before they can search for or access the histology reports.

Key points

- Written consent from the next-of-kin of a deceased person is not required to authorise the disclosure of confidential information such as histology reports. In such circumstances, disclosure may be justified in the interests of living relatives who may provide verbal consent.
- Seeking consent from the next-of-kin of George's relatives could compromise George's confidentiality, and would create an additional administrative burden while having limited usefulness (as signatures of the next-of-kin are unlikely to be verifiable by the pathology department in any case).
- A similar scenario might be a cancer registry refusing to release information it would have been previously happy to disclose, on the mistaken belief that the legitimate basis for data processing is consent; it is not in this situation.

5.2.2 Future use of patient data

Important changes to the way patient data are governed will impact upon how health professionals are able to access, use and reinterpret data. Going forward, health professionals need to be aware of these changes to understand how they can act in ways that are both ethical and compliant with the law. Professionals will need to understand in broad terms, the legal basis on which they hold patient data, and the limits to its use under data protection laws including the EU General Data Protection Regulation 2018 and the UK Data Protection Act 2018. They may also need to understand what rights patients and family members have to be informed about the data that is held about them (see Appendix 3 for more details).

5.2.3 National or international disease or mutation databases

The complexity of genomic information means that interpreting genomic variants can be challenging and relies on matching genomic variants and phenotypic features with affected individuals. The Genomic Medicine Service aims to provide an infrastructure for identifiable genomic variants and phenotypic findings to be shared within the NHS.

Understanding the epidemiology of disease can inform evidence-based care, health services and research. Collecting patient data into various disease registers (eg the National Congenital Anomaly and Rare Disease Registration Service (NCARDRS) and the National Cancer Registration and Analysis Service (NCRAS)) is a key function of Public Health England (PHE). Cancer registries are a valuable source of information and can help to confirm a family history of disease. Patients should be informed in general terms that their information may be used in this way and that this is an important part of service evaluation and gathering evidence for their future healthcare.

5.3 Prenatal genomic testing

The possibility of accessing fetal cells in the early stages of a pregnancy (for example, non-invasive prenatal testing (NIPT) or trophoblast retrieval and isolation from the cervix (TRIC)) and examining these with new genomic technologies are providing novel opportunities for diagnostic testing and treatment.²⁸ For example, since NIPT testing involves taking a blood sample from the pregnant woman at around 9–10 weeks of pregnancy, it does not carry the risk of miscarriage that amniocentesis or chorionic villous sampling does, and can be offered at an earlier stage of pregnancy than either of these latter two techniques. Consent for testing will usually involve taking consent from the mother as the fetus is regarded in law as an extension of the mother, not having independent legal identity. However, optimal interpretation of findings in the fetus may require samples from both parents (trio testing) thus drawing others into the consent process. Taking consent for prenatal testing may involve additional considerations, not least the potential impact of the outcome of the test on the continuing pregnancy. For this reason, extra care is needed when communicating uncertain findings concerning the fetus. These issues will be explored in more detail in forthcoming guidance from the British Society for Genetic Medicine.

5.4 Tumour testing and personalised treatment

Tumour testing to indicate genetic abnormalities (for example, immunohistochemistry analysis) is by no means new, but use of whole genome technologies to compare tumour and germline sequences is providing increasingly granular mapping of genomic architectures. This in turn creates new opportunities for tumour testing to guide diagnosis, treatment and prognosis. Understanding the basis for mutational changes within a tumour by comparing it with germline tissue from the patient can help to determine particular treatments optimised for that individual such that the chances of successful treatment and recovery are increased. The Human Tissue Act 2004 establishes a framework for using cellular material and is extensively discussed in the previous version of this guidance. We refer the reader to Appendix 3.²⁴

5.5 Where to turn to for advice or support

Discussion of particular instances where the practitioner is concerned about an aspect of consent or confidentiality is recommended in the first instance within the multidisciplinary team. Make sure you document discussions and any decision made in the patient's or family's medical record, stating which individuals contributed to any decision.

Many hospital trusts will have a clinical ethics committee which would be pleased to discuss individual cases or challenging issues on an anonymised basis.

The UK Genethics Forum (www.genethicsUK.org) holds meetings three times per year for relevant health professionals. Meetings held around the country allow for more detailed discussion of ethical/legal issues and cases, and provides email support (genethics.forum@gmail.com) in the interim.

Appendix 1 Template documents

A1.1 Consent to access medical records

Letter and form requesting consent to access medical records

Dear xxx

A relative of yours has been referred to [insert details] to assess whether they are at increased risk of [insert details] because of their family history of [insert details]. Sometimes an inherited factor can explain why several people in a family have certain conditions. Your relative has provided your name as someone whose medical information might be useful in carrying out this assessment.

In order to do this, it would be useful to access information about medical tests and treatment that you have received. The purpose of this letter is to request your written consent to access your medical records at the hospital where you were treated.

This information will be treated in confidence and will not be used for any purpose other than making an assessment of your family history and thereby informing relatives for whom it is relevant.

I would be most grateful if you could complete the enclosed consent form and return it to me at your earliest convenience. Please let me know if you would like any more information about this assessment.

[Signature and contact details]

[Instructions to addressee: Please complete below details and return it in the enclosed stamped addressed envelope]

I, the undersigned, consent to the release of information contained in my medical records.

Name

Date of birth/...../.....

Address

Date of diagnosis

Type of diagnosis.....

Hospital where treated.....

Consultant

Address at time of diagnosis

Print name

Signature of authorisation

Date/...../..... Family reference No

A1.2 Record of discussions form to summarise clinical consent

RECORD OF DISCUSSIONS regarding testing and/or storage of genetic material

I have discussed genomic/genetic testing with my health professional and I understand that:

Family implications

1. The results of my test *may* have implications for other members of my family. I acknowledge that my results may sometimes be used to inform the appropriate healthcare of others. This could be done in discussion with me, or in such a way that I am not personally identified in this process.

Uncertainty

2. The results of my test *may* reveal genetic variation whose significance is not yet known. Deciding whether such variation is significant may require sharing of information about me including (inter)national comparisons with variation in others. I acknowledge that interpretation of my results may change over time as such evidence is gathered.

Unexpected information

3. The results of my test *may* reveal a chance of a disease in the future, and nothing to do with why I am having this test. This may be found by chance, while focusing on the reason for my test, and I may then need further tests to understand what this means for me. If these additional findings are to be looked for, I will be given more information about this.

DNA storage

4. Normal laboratory practice is to store the DNA extracted from my sample even after the current testing is complete. My sample might be used as a 'quality control' for other testing, for example, that of family members.

Data storage

5. Data from my test will be stored to allow for possible future interpretations.

Health records

6. Results from my test and my test report will be part of my patient health record.

Note of other specific issues discussed (*eg referral to particular research programmes, insurance*):

I agree to genetic/genomic investigations*	DATE ____/____/____
----- Patient/parent signature -----	Discussion undertaken by: (clinician's name and signature) -----

Affix sticky label or fill in details

Patient name: _____

Date of birth ____/____/____

Patient address: _____

Genetics ref. _____

1 COPY for notes, 1 COPY for patient to retain

**insert details here, eg to investigate the cause of my child's developmental delay / family history of cancer / heart disease etc*

Appendix 2 Data protection (General Data Protection Regulation, Data Protection Act 2018 and National Patient Data Opt-out)

A2.1 The General Data Protection Regulation

Data protection law is being reformed to strengthen the rights of data subjects and increase transparency about how data is accessed and used. A new EU General Data Protection Regulation (GDPR), implemented in May 2018, acts directly on member states within Europe (including the UK).²⁹ This applies to all personal data (ie information relating to ‘an identified or identifiable natural person³⁰ who can be identified by a range of factors, including factors specific to the physical, physiological or genetic identity of that person’).

A2.2 Main provisions

A2.2.1 Legal bases for data processing

Personal data may only be processed if there is an applicable lawful basis. In the context of healthcare, this is usually that the ‘processing is necessary for the performance of a task in the public interest’³¹ namely the provision of health, social care or public health. Consent is another potential legal basis for data processing but is less likely to be relevant in a health setting. This does not mean that consent is not important, simply that it is usually not the legal basis for data processing in this setting (see also case 17).

A2.2.2 Special categories of data

As well as demonstrating a legal basis for processing, certain ‘special categories’ of personal data are given additional protection by the Regulation. These include ‘data concerning health’ and [identifying] genetic data and biometric data which can only be processed if additional conditions are satisfied. In the context of health services, the most relevant such condition is that the data processing is necessary for the purpose of medical diagnosis, the provision of health or social care, or treatment or management of health or social care systems or services;³² or constitutes data which is processed under obligations of secrecy or confidentiality by a professional. Other conditions include that the processing is ‘necessary for reasons of substantial public interest’ or that the data subject has given explicit consent to the processing of those data.

A2.2.3 Changing requirements for consent

For consent for data processing to be valid under the GDPR, it must be ‘freely given, specific, informed and unambiguous’: namely a clear affirmative action signifying consent. This means that some forms of consent which were valid under the previous Data Protection Act will be insufficient, for example, opting in or out by default. As outlined above, another legal justification for data processing will often be the most appropriate in healthcare and does not affect the consent process for other elements of clinical care, such as having a blood test, or a specific intervention such as imaging or surgery. Explicit consent for data processing may remain important for some purposes, such as where personal data is shared more widely outside the UK to other countries which do not have such robust privacy regimes.

A2.2.4 Strengthening of data subjects’ rights

The GDPR strengthens the position of data subjects in a variety of ways: it creates rights for data subjects to be informed about how personal data identifying them is used and stipulates that data can only be processed if certain safeguards are met. Data subjects have new rights to access, rectify, erase, restrict and move data that identify them, unless exemptions apply. Examples of exemptions

are where processing of personal data is necessary to provide health or social care or for public health. Most personal data held by the NHS is used for clinical care, diagnosis and treatment and patients cannot withdraw or withhold their data. However, where data is used for other purposes, such as some types of research, these additional rights might apply and data subjects might choose to withhold their data (see section A2.4). Data subjects have additional rights to object to certain types of data processing (such as where automated processing / decision-making is used).

A2.2.5 Accessing and using data for research

The GDPR allows personal data to be used for various types of research if certain safeguards are satisfied. These safeguards include that data should be pseudonymised (or deidentified) if this is possible and does not prevent the fulfilment of the research. Provided these safeguards are met, some of the data subjects' rights which would otherwise apply (eg to have access to data, to restrict or object to processing) are waived.³³ Other provisions allow personal data to be used for secondary purposes (such as scientific research) without informing the patient (or data subject) if providing such information would impair the objectives of the research.

A2.3 Data Protection Act 2018

The GDPR has repealed the Data Protection Act 1998, and this has been replaced by the Data Protection Act 2018³⁴ which provides detail about how the safeguards described in the GDPR should be met in the UK (as well as clarifying how the GDPR applies to intelligence surveillance and law enforcement). For example, the Data Protection Act provides detailed examples of where data can be shared between health professionals. It also creates a criminal offence for the deidentification of data without reasonable cause (section 171 DPA 2018).

A2.4 National data opt-out

The national data opt-out programme came into force in May 2018. This allows individuals to be offered a one-off choice as to whether their confidential patient information can be used for research or planning purposes outside of direct care. This choice is intended to supplement the GDPR and will not influence the legal basis for processing personal data under that regulation or the Data Protection Act 2018. The hope is that clarity about individuals' views on data sharing will enable more data to be used for research and other secondary purposes. More details of the national patient data opt-out can be found at <https://digital.nhs.uk/services/national-data-opt-out-programme/guidance-for-health-and-care-staff>.

Appendix 3 Human Tissue Act 2004

This text has been reproduced from the second edition of the consent and confidentiality guidance for ease of reference – it has not been revised for this guidance.

A3.1 Overview

The 'ownership' of human tissue is illustrated by the common law doctrine that there is 'no property' in a body; thus, there is no legal owner of a dead human body or, by inference, of 'dead' body parts. Instead of conferring property value, the law has focused on the definitions of 'legal possession' of the body, which is a concept describing a transient 'guardianship', in contrast to ownership. A person may have legitimate 'possession' of a body or body part until such time as a person with a greater claim arrives to take possession of the body for burial or appropriate disposal. Alternatively, a practitioner might be viewed by the law as having legal possession of a tissue if that tissue had been removed with consent. Following the revelation that several English hospitals had retained patients' body parts without the consent of their families, it became apparent that existing law made no provision to proscribe such behaviour, which was considered to be unethical by those who investigated the facts, describing the views of the hospitals involved as 'institutional paternalism'. The chief medical officer responded with advice and a government consultation formed the basis of the Human Tissue Act 2004 (HTA).

This legislation impinges very little on the everyday diagnosis, investigation and treatment of patients. These activities are governed by the rules that govern obtaining a patient's consent, as provided by the common law and the Mental Capacity Act 2005 (MCA), and laid out as guidance by, among others, the GMC. However, some clinical activities outside the immediate realm of diagnosis and treatment are affected by this Act. The Act also introduces an offence of 'DNA theft', something that was thought to be particularly relevant to clinical genetic practice though, as we will discuss below, the final wording of this part of the legislation meant that DNA theft was limited to very circumscribed circumstances.

The HTA was implemented on 1 September 2006 and provides a legal framework in England, Wales and Northern Ireland for regulating the storage and use of 'relevant material' from the living, and removal, storage and use of tissue from the deceased for 'scheduled purposes', underpinned by consent from the 'appropriate' person. 'Relevant material' in this context is defined as material from a human body that consists of or includes human cells, with the exception of gametes, embryos outside the body, and hair and nail from a living person, which are all excluded from the Act. Chromosome preparations in fixative, dried blood spots and unfixed tissues fall within the HTA, but cell lines (including lymphoblastoid) and extracted nucleic acid (DNA) are excluded, as is any other human material created outside the human body. Interpretation of the Act is supported by codes of practice that are updated regularly.³⁵ Similarly what counts as relevant material is also updated as new technologies are developed.³⁶

Human Tissue Act scheduled purposes

Scheduled purposes are defined as those purposes that generally require consent under the Act. They are as follows.

Part 1 Purposes requiring consent: both living and deceased persons

- 1 Anatomical examination
- 2 Determining the cause of death
- 3 Establishing after a person's death the efficacy of any drug or other treatment
- 4 Obtaining scientific or medical information about a living or deceased person which may be relevant to any other person (including a future person)
- 5 Public display
- 6 Research in connection with disorders or the functioning of the human body (but see below)
- 7 Transplantation

Part 2 Purposes requiring consent: deceased persons only

- 8 Clinical audit
- 9 Health-related education or training
- 10 Performance assessment
- 11 Public health monitoring
- 12 Quality assurance

The Act distinguishes between samples taken before (ante-mortem) and after death; the ante-mortem rules apply even if the donor subsequently dies. Thus the death of a patient does not change the purposes for which it can be used (such as clinical audit or research involving anonymised samples).

It is lawful for cellular material from a living person to be stored and used without any consent for clinical audit, quality assurance and performance assessment (which could include evaluations of *in vitro* diagnostic devices), public health monitoring and health-related education and training. This is because these activities are considered integral to good medical care.

Appendix 3.1.1 Consent for analysis of cellular material

In general, a living competent adult or child must give consent to the removal, use and analysis of his or her own tissue. After death, only those in a ranked relationship can provide consent. Consent should be sought from those at the top of the list. If it is not reasonably practicable for this person to give consent (for example, because their contact details are unknown, or they do not wish to make a decision) a person from the next level down the hierarchy may be contacted. Where two or more people have equal ranking it is sufficient to obtain the consent of one of them. Consent to the removal of tissue from the living person is not regulated by the HTA and remains a matter for the common law.

A3.1.2 Research

It is legal to perform health-related research on anonymised material derived from living people without consent as long as it is approved by a research ethics committee. 'Anonymised' in this context means that the person carrying out the research is not able to identify the donor, and is not likely to do so in the future.

A3.1.3 Samples taken after death including at post-mortem examination

The HTA has made the retention of samples from post-mortem more transparent, and strengthened the role of relatives in that process. Previously, samples could be retained for 'therapeutic, educational and research purposes' if there was no reason to believe that the deceased or surviving spouse or relatives would object. Written consent is now required.

A3.1.4 Existing holdings: cellular material held before 1 September 2006

Where material held before 1 September 2006 is to be analysed for scheduled purposes (or if anonymised, for any purpose) then the consent requirements of the Act do not apply. This means that this material can be analysed for the benefit of family members without consent.

A3.1.5 Samples collected as part of the newborn screening programme

When it is necessary to perform a diagnostic test on a sample which was collected as part of the newborn screening programme (for instance, a dried blood spot sample), specific consent beyond the screening programme must be obtained.

A3.2 Requirements of the Human Tissue Act relevant to genetic medicine

A3.2.1 Consent for analysis of DNA in cellular tissue

Special rules apply where cellular tissue is held for the purpose of analysing the DNA within it. The Act lists those who can give 'qualifying consent' for analysis of DNA in cellular tissue (consent in the rest of the Act is called 'appropriate consent'). In general, a living competent adult or child must give consent to the analysis of his or her own DNA in cellular material for any of the purposes covered by the Act. The gaining of 'qualifying consent' is sufficient to prevent an offence of 'DNA theft' under the Act. Those with parental responsibility can give consent for a child. The DNA analysis of posthumous cellular samples is regulated by the wishes of the donor immediately before s/he died, or if no such decision was made, by the consent of a representative appointed by or having a 'qualifying relationship' with the donor. (In this context, 'DNA analysis' is interpreted broadly and includes any process intended to provide information about the DNA in the bodily material such as DNA sequencing, and methods of deducing information about the DNA from RNA, protein and metabolites).

Those who can give qualifying consent:

- spouse or partner
- parent or child
- brother or sister
- grandparent or grandchild
- child of a brother or sister
- stepfather or stepmother
- half-brother or half-sister
- friend of long-standing.

This list is not ranked; anyone on it can provide consent.

A3.2.2 Consent for analysis of extracted DNA

The legal requirements of the Act regarding consent, storage and use do not apply to nucleic acids already extracted from, or cell lines derived from, the cellular material governed by the HTA. This is an important distinction from section A3.2.1 since the extracted DNA stored in NHS diagnostic laboratories is therefore not governed by the HTA. Common law and professional guidance determine the consent requirements for analysis of such samples.

A3.2.3 Non-consensual analysis of DNA held in cellular material ('DNA theft')

A majority of genetic tests are undertaken as part of the medical diagnosis or treatment of the person whose body manufactured the DNA. Where cellular material is held with the intention of extracting DNA and using it for such purposes, it falls outside the HTA. However, the Act does establish that it is a criminal offence to hold bodily material with the intention of analysing human DNA from it without consent for other specific purposes, including research, and where the purpose includes testing for the benefit of a family member (for example, paternity testing). These provisions were prompted by the Human Genetics Commission which recommended that the theft of DNA and its use for malicious or prurient reasons to be unlawful. Analysing extracted DNA (which has been separated from its parent tissue at some previous time point) does not constitute an offence under the Act; it is only the holding of bodily material with the intention of analysing the DNA within it that does.

A3.2.4 Consent requirement for analysis of cellular material to assist in the care of other relatives

Specific consent under the Act is required to use cellular material where the primary purpose is to assist in the diagnosis and treatment of other relatives. As noted above, this does not apply to extracted DNA.

For an adult with capacity, testing of their stored cellular sample should generally only be undertaken with their consent, since any result may have implications for their diagnosis and/or management. Contact might be re-established through the family member who is seeking advice from the genetics clinic, and who may stand to benefit from the results of the testing.

A person may make a decision about what happens to their tissue after death, or appoint a nominated representative to make a decision on their behalf, but if s/he has not provided a valid consent during their lifetime, then after death, a consent from someone 'appropriate' must be sought. For analysis of cellular tissue the list of those that can provide consent is ranked, while 'qualifying consent' (an unranked list) is required if the intention is to analyse the DNA within the cellular material (see section A3.2.1).

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