CellPress

Postmortem disclosure of genetic information to family members: active or passive?

Sarah N. Boers[1], Johannes J.M. van Delden[1], Nine V. Knoers[2], and Annelien L. Bredenoord[1]

[1] Department of Medical Humanities, Julius Center for Health Sciences and Primary Care, University Medical Center Utrecht, Str 6.131, PO Box 85500, 3508 GA Utrecht, The Netherlands
[2] Department of Medical Genetics, University Medical Center Utrecht, KC04.084.2, PO Box 85090, 3508 GA Utrecht, The Netherlands

Advances in next-generation DNA sequencing (NGS) now make it possible, and affordable, to sequence the entire genome of an individual. Routine clinical application is on the horizon. There is a consensus that some subsets of genetic information should be disclosed to patients, but disclosure to their relatives is less consensual. This issue becomes especially salient after a patient's death, when permission can no longer be sought. There has however been little debate on postmortem disclosure. We identify and explain the arguments in favor of and against disclosure of genetic information to the relatives of a deceased patient. We conclude that there are valid reasons to communicate some subsets of genetic information to family members after death, and we propose a passive postmortem disclosure policy.

Disclosure dilemmas after death

Advances in next-generation DNA sequencing (NGS; see Glossary) have now made it both feasible and affordable to sequence the entire genome of an individual. Routine clinical application is on the horizon [1–3]. Sequencing the complete exome or indeed the whole genome of a patient generates an overwhelming amount of data, yielding both solicited and unsolicited findings. The unequalled quantity of data, and the wide variation of validated and non-validated, highly and poorly predictive, and more or less probabilistic data, leads to ethical, legal and counseling challenges that surround the feedback of individual genetic information [1,4–6].

There is now a consensus that at least some subsets of genetic information should be disclosed to patients [1,4–6] (i.e., clinically relevant and actionable genetic aberrations), but communication to family members of genetic information about hereditary risk is less consensual. Individuals share a significant fraction of their genomic sequences with (biological) relatives. At-risk family members may therefore have a legitimate interest in also receiving results, especially if genetic information is available which may have a bearing on their own health. Disclosure of genetic information to family members becomes especially salient when patients have passed away, and their permission can no longer be sought [6–10]. In this paper we identify and explain the potential arguments in favor of and against postmortem disclosure to relatives of the deceased (Table 1). We examine whether genetic information should be disclosed, and argue in favor of a passive postmortem disclosure policy.

Glossary

Beneficence: the duty to do good.
***BRCA1/BRCA2*:** two genes regularly screened for inherited forms of breast/ovarian cancer. Both are tumor-suppressor genes, and mutations in both are associated with increased risk of these cancers.
Biological relatives: persons who, to a significant extent, have a shared genetic structure.
Disclosure: communication of genetic and/or genomic information to patients or family members of patients or deceased patients.
Exome: genetic information limited to the sequences of protein-coding genes in a genome. The protein-coding genes lie within exons, which constitute about 1% of the whole genome.
Genome: the entire set of genetic information found in a cell. In humans the genome consists of 23 pairs of chromosomes in the nucleus, as well as a small chromosome in the mitochondria. Taken together, these chromosomes contain approximately 3.1 billion bases of DNA sequence.
Multiple endocrine neoplasia syndrome type 2a (MEN2A): an autosomal dominant predisposition to tumors of thyroid C cells (medullary carcinoma), adrenal medulla (pheochromocytoma), and nodular hyperplasia of parathyroid glands.
Negative autonomy: an individual's right to make his/her own decisions without interference or coercion from others.
Next-generation sequencing (NGS): also known as high-throughput sequencing, NGS describes a number of modern sequencing techniques that sequence DNA and RNA much more quickly and cheaply than the formerly used Sanger sequencing method.
Nonmaleficence: the prevention or avoidance of harm.
Positive autonomy: an individual's ability to take control of his/her own life and to be able to fulfill their own values and beliefs.
Postmortem disclosure: revealing genetic and/or genomic information to family members of deceased patients.
Privacy: an individual's personal autonomy that makes him/her master of all facts about their own identity. A patient's right to privacy follows from respect for a patient's autonomy.
Solicited findings: genetic variants specifically searched for in a clinical or research context.
Unsolicited findings: collaterally obtained byproducts outside the targeted scope.

Corresponding author: Boers, S.N. (s.n.boers@umcutrecht.nl).
Keywords: ethics; postmortem disclosure; genetic information; next-generation sequencing; family members.

1471-4914/
 http://dx.doi.org/10.1016/j.molmed.2015.01.002

Table 1. Arguments for and against postmortem disclosure to relatives

Arguments for disclosure	Arguments against disclosure
Beneficence	A relative's right not to know
The duty to warn relatives	Nonmaleficence
Fostering the autonomy of relatives	Respect for a deceased's wishes as expressed in life
The familial nature of the human genome	Respect for a deceased's (genetic) privacy and confidentiality
	Disclosure is not feasible

Arguments in favor of postmortem disclosure

Beneficence

A first argument to support disclosure of genetic information to the family members of a deceased patient is the principle of beneficence [4,8,11]. Disclosure could promote the health or well-being of a relative if treatment or prevention for the hereditary condition is available [7,8,12–15]. Awareness of a *BRCA1/2* mutation, for instance, could enable affected relatives to opt for prophylactic surgery to prevent development of breast cancer [6]. Furthermore, a genetic diagnosis could have psychological benefits, such as in understanding the origin of a particular disease that has a high frequency within the family (e.g., colon cancer) [15,16]. However, the positive duty of beneficence towards relatives cannot be limitless, and must be demarcated [17,18]. One cannot expect physicians to promote the well-being of relatives of their deceased patients limitlessly because, for example, this would interfere with their primary tasks.

The duty to warn relatives

The second argument in favor of postmortem disclosure is the duty to warn. Some argue that physicians have a duty to warn family members of hereditary disease risk, provided that particular conditions are met: the clinician should take reasonable actions to disclose genetic information to relatives if that information encompasses a condition potentially leading to serious, imminent, and actual harm, and for which treatment or prevention is available [19–21]. Multiple endocrine neoplasia type 2a (MEN2A) is one such condition –prompt detection of thyroid cancer in individuals with this syndrome can lead to early treatment, whereas late detection frequently leads to incurable disease [22].

It could be said that the duty to warn relatives surpasses a patient's death [20,21]. During life it is generally considered sufficient for a physician to encourage patients to inform their relatives of hereditary risks [3,19]. However, after their death this is no longer possible, and it could be argued that a clinician's moral obligation then becomes stronger, particularly if genomic data only become available after a patient's death [8,23]. Nonetheless, the duty of the physician to warn the relatives of the deceased is again not without qualification because confidentiality and feasibility must also be taken into consideration [19,24].

Fostering the autonomy of relatives

Postmortem disclosure may foster the positive autonomy of family members, and this provides the third argument in favor of disclosure. Genetic information could facilitate the management of the health of relatives and of their children, may contribute to reproductive decision-making, and could influence the way they choose life projects or approach life planning [4,25,26]. Furthermore, they could derive existential meaning from knowledge on their genetic make-up [27]. Fostering autonomy through disclosure surpasses the mere promotion of well-being because disclosure enables relatives to take (some) control of their lives [17,28]. Nevertheless, the extent to which physicians have a responsibility to promote the autonomy of the relatives of the deceased remains a point of contention. It may be unduly exigent to require a physician to promote the autonomy of a relative with whom no clinical relationship is present.

The familial nature of the human genome

The fourth argument in favor of postmortem disclosure regards the familial nature of the genome. Although human beings share 99.9% of their DNA, each person has a unique arrangement of 3 billion base pairs [29]. A significant fraction of that package is shared with first-degree relatives. This biogenetic kinship defines family by the sharing of genes. In some cases, blood samples from relatives may be necessary to diagnose patients at risk of genetic disease. Moreover, the specific medical diagnosis of a patient can have a profound health impact on close relatives [29]. The enrollment of an individual in NGS testing could even cause harm to relatives [26,30].

In view of these considerations, some have argued that the sequence of the genome could be considered to be familial in nature. It has even been argued that DNA is 'shared property' with biological relatives [12,31,32]. As a consequence, it is argued that the biological relatives of the patient should be able to access the patient's genetic information so as to identify their own health risks or verify the existence of a genetic disease [12,25,33].

However, regarding the genome as shared familial property brings some difficulties. First, it would require outlining the biogenetic family. What 'degree of relatedness' (i.e., first degree, second degree, etc.) would a person need to have with a family member to take part in the 'shared possession'? Second, viewing DNA as shared property would imply a need to request for consent from the wider family [26]. This would raise numerous ethical, counseling, and practical challenges, and might even bring participation in NGS testing into question. Third, the autonomy of the patient is challenged. To consider DNA as 'shared property' risks restricting the autonomous decision-making of the patient, and perhaps also of his/her relatives. Therefore, the genome should not be regarded as 'shared property', but nevertheless the familial dimension of DNA must be taken into account when considering postmortem disclosure.

Arguments against postmortem disclosure

A relative's right not to know

A first argument against postmortem disclosure is the potential violation of family members' right not to know [34,35]. Some people do not wish to be informed of their genetic status. For example, only 50–75% of first-degree