COMMENTARY | Genetics inMedicine

New "first families": the psychosocial impact of new genetic technologies

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In the mid-20th century, the diagnosis of single-gene disorders dominated the pediatric clinical genetics landscape. Families with children who were ill for years received late diagnoses of diseases that were considered rare, about which little was known, and for which little could be done. Families were overwhelmed by the sadness of the news and lack of information and struggled alone, often never meeting another family with their child's diagnosis, particularly if they lived in rural areas or far from an academic center. Parents coped valiantly against overwhelming forces. My own research on the early families struggling with a child with cystic fibrosis,[1] ataxia-telangiectasia,[2] and X-linked severe combined immunodeficiency[3] is illustrative of the long-term impact on parents and siblings of these rare single-gene disorders. These diseases were chronic and had grim prognoses that were given by physicians whose task was to do as much as they could with few medical solutions. Parents who were not immobilized by distress channeled their energy into fighting for a cure. They organized disease-specific foundations, started support groups, and wrote books to honor and give meaning to the life and death of their child.[4] Dedicated physicians who saw child after child afflicted with these diseases were not unaffected and focused their intellectual and emotional energies on the specific condition. A noteworthy example is Harry Shwachman, pioneering researcher of cystic fibrosis, who directed his entire professional life to caring for these children and their parents.[5] Healthy siblings grew up with overwhelmed parents who had to direct most of their energy and passion to helping their afflicted child. Years later, brothers and sisters of these "first families" found their voices, and wrote books immortalizing the struggle of their ill sibling as well as their own. The younger sibling of a brother with X-linked severe combined immunodeficiency who had lived for years in a plastic "bubble" wrote of her life and of the impact of a brother or sister's death on remaining siblings.[6] The daughter of one of the founders of the Canadian Cystic Fibrosis Foundation published a memoir of her relationship with her sister who died of cystic fibrosis.[7]

Fortunately, aided by the passion and fundraising of these early families, medical advances in treatment, as well as early identification through newborn screening, far better prognoses are now standard. The efforts of these early families were also successful in creating a vast network of national and local support groups throughout the country. Advances in social media and the Internet have allowed development of a world in which parents can receive and give support to each other. With improved medical outlook for these children and with parents having more resources and feeling less isolated, families with new diagnoses of single-gene disorders may be at less risk for psychosocial difficulty than in prior decades.

However, with the increased use of microarray analysis and whole-genome or whole-exome sequencing in solving medical puzzles, a new generation of first families is emerging, highly reminiscent of these early first families. Circumstances related to genetic testing are both similar and distinct from the past. Families will struggle again with conditions that may prove serious if not lethal, and with possibly little to no support from other families. In fact, a recent study found that parents receiving results from microarray analysis felt confused and isolated, and wished they could speak with another family in their situation.[8] This should sound a warning not to repeat history.

The output of new technologies, differences in current medical practice, and the collaborative nature of genetics research differ from the past. For example, where previous technology yielded results in response to suggestive symptoms, the output from microarray testing and exome sequencing often yields disturbing findings, including false-positives, ambiguous results, and variants of unknown significance. Identification of unnamed and unknown disorders would be expected to create compelling anxieties and uncertainties, both for the medical provider as well as the family. In addition, output from genome and exome sequencing often includes unanticipated positive results not relevant to presenting symptoms. Unexpectedly, parental genetic or medical conditions may be revealed. This information overload may prove difficult for the physician, who must decide what to disclose to the family, how, and when, causing both physician and family to grapple with these complexities. In the past, the pediatric specialist ordered the test and disseminated results; currently diverse medical providers request these tests and there is little control or knowledge of how results are communicated to the family.

Currently, the role of genetics is far more recognized in our society, which may lead to decreased feelings of stigmatization. On the other hand, popular understanding of genetics is often misguided or incorrect. The availability of genetic information

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Submitted 24 June 2011; accepted 22 September 2011. doi:10.1038/gim.2011.17

on the Internet may be problematic in that it frequently contains misleading information, causing needless concern. Further, the dedicated sole researcher of prior generations has been replaced by a trend toward more team efforts; this may offer some emotional protection to the physician but may interfere with the strong physician–family bond that helped families.

Because the application of new genetic technologies differs in important ways from the more limited but straightforward tests of prior generations, these scientific advances raise important research questions for providers and families:

1. How well do parents and siblings understand microarray, genome, and exome sequencing results?
2. What are the long-term emotional consequences for parents and siblings of coping with the ambiguities and uncertainty associated with these tests?
3. How effectively do families identify resources, particularly support from others?
4. How well do medical providers manage these complex findings and facilitate interconnections between families?

Research on these questions could illuminate how providers should manage transmission of test results to families. Factors that may mitigate adverse outcomes, such as the Internet, connections with others, and provider facilitation of support, should be investigated. Identification of variables affecting risk and promoting resilience will be essential in developing appropriate interventions for families.

Parents in this new generation of "first families" are likely to be at great risk of being overwhelmed and highly distressed with few emotional resources available for each other, their affected child, and their healthy children. Medical providers should be alert to potential challenges and risks and help these families understand increasingly complex test results. As new technologies offer great promise in the detection and diagnosis of disease, we should pay close attention to ensure that a new generation of parents does not struggle alone and that their children do not have to wait for years to share their story.

ACKNOWLEDGMENTS

John P. Johnson provided thoughtful comments and insight. This publication was developed with support from the New England Genetics Collaborative, funded by a federal cooperative agreement from the US Department of Health and Human Services, Health Resources and Services Administration, CFDA 93.110, U22MC10980. Additional funds were provided by NIH P50 HG003389 to the Stanford Center for Biomedical Ethics.

DISCLOSURE

The author declares no conflict of interest.

REFERENCES

1. Fanos JH. Sibling Loss. Erlbaum: Hillsdale, NJ, 1996.
2. Fanos J, Mackintosh M. "Never again joy without sorrow": effect on parents of a child with ataxia-telangiectasia. Am J Med Genet 1999;87:413–420.
3. Fanos JH, Puck JM. Family pictures: growing up with a brother with x-linked severe combined immunodeficiency. Am J Med Genet 2001;98:57–63.
4. Deford F. Alex: The Life of a Child. Viking Press: New York, 1983.
5. Fanos JH. "We kept our promises": an oral history of Harry Shwachman. Am J Med Genet 2008;146A:284–293.
6. DeVita-Raeburn E. The Empty Room: Surviving The Loss of a Brother or Sister at Any Age. Scribner: New York, 2004.
7. Cariou HS. Sixtyfive Roses: A Sister's Memoir. McArthur: Toronto, Canada, 2006.
8. Reiff M. Dealing with uncertainty in microarray testing: seeking understanding and the need for clarity. Paper presented at the ELSI Congress 2011, National Human Genome Research Institute, NIH, at the University of North Carolina, Chapel Hill, 12 April 2011.