WOMEN'S HEALTH

DECEMBER 2020 | A NEWSLETTER FOR MEDICAL PROFESSIONALS

Benefits of a Standard, Consistent Carrier Screening Approach

Ethnicity-based screening is offering carrier screening based on a patient's self-reported ancestry.[1] This can be challenging because patients may be unsure of their genetic ancestry.[2] As diversity continues to increase, identifying individual conditions for carrier screening based on ethnic background may be less clear.

Single-gene carrier screening

Historically, carrier screening was offered based on a patient's ethnicity and studied a finite number of disorders known to have increased prevalence in certain populations.[3] The earliest carrier screening programs focused on sickle cell disease in the African American population and Tay-Sachs disease in the Ashkenazi Jewish population. This testing was originally performed via biochemical testing in the case of Tay-Sachs disease, and routine chemistry for sickle cell disease and the thalassemias.[4,5] While ethnicity-based screening was valuable in patients with known ethnicity for a finite number of disorders, it is limiting in our increasingly diverse society since many patients have complex ethnicity, or are unaware of their true ethnicity.[2,6]

In addition, while some disorders may be more common in certain ethnic backgrounds, genetic disease can be found in patients of any ethnicity, albeit less commonly in some groups than others.[2] One example is Tay-Sachs disease. Tay-Sachs disease is a progressive neurological disorder, historically found most commonly in patients of Ashkenazi Jewish ancestry.[7,8] Today, the majority of babies born with Tay-Sachs disease are actually born to parents who are not of Ashkenazi Jewish descent.[7] This may be because patients who do not report Ashkenazi Jewish ancestry are less likely to be screened for Tay-Sachs disease.

Testing evolution and a new approach

The sequencing of the human genome led to advancements in ethnicity screening, allowing for a shift from biochemical analyses to molecular ones, initially accomplished by targeted mutation analysis of known pathogenic mutations. The knowledge gleaned from the human genome project also allowed for population screening of common, pan-ethnic disorders like cystic fibrosis in the early 2000s and more recently, spinal muscular atrophy.[9,10,11]

These advancements have also allowed patients access to more affordable and comprehensive carrier screening options, known as "expanded" carrier screening.[12] Expanded carrier screening (ECS) screens for a larger number of genes to be tested simultaneously, and at a potentially lower cost than was observed with single-gene screening.[12,13] ECS could be offered to all patients regardless of ethnicity.[1] Ultimately, this should result in the identification of more carriers, and most importantly, identification of more pregnancies at risk for genetic disorders.[2]

View Past Editions of Labcorp's Women's Health Newsletter

HEALTH AWARENESS CALENDAR

JANUARY

- Cervical Health Awareness Month
- National Birth Defects Prevention Month

SUMMARY

The American College of Obstetricians and Gynecologists' (ACOG) Committee Opinion No. 690 on carrier screening recommends each provider establishes "a standard [screening] approach that is consistently offered to and discussed with each patient."[3]

References

1. Carrier Screening Frequency Asked Questions: Pregnancy. https://www.acog.org/patient-resources/faqs/pregnancy/carrier-screening#:~:text=In%20targeted%20carrier%20screening%2C%20you,called%20ethnic%2Dbased%20carrier%20screening. Accessed 8 Oct 2020.

2. Lazarin, G., et al. An empirical estimate of carrier frequencies for 400+ causal Mendelian variants: results from an ethnically diverse clinical sample of 23,453 individuals. *Gent. Med.,* 2013:15(3): 178-186.

3. Committee opinion of the American College of Obstetrics and Gynecologists. Carrier screening in the age of genomic medicine. Obstet Gynecol. Number 690, March 2017.

4. ACOG Committee on Obstetrics. ACOG Practice Bulletin No. 78: hemoglobinopathies in pregnancy. *Obstet Gynecol.* 2007 Jan;109(1):229-37. doi: 10.1097/00006250-200701000-00055. PMID: 17197616.

5. ACOG Committee on Genetics. ACOG committee opinion. Number 298, August 2004. Prenatal and preconception carrier screening for genetic diseases in individuals of Eastern European Jewish descent. *Obstet Gynecol.* 2004 Aug;104(2):425-8. doi: 10.1097/00006250-200408000-00050. PMID: 15292027.

6. The United States Census 2010.

7. Gross SJ, Pletcher BA, Monaghan KG; Professional Practice and Guidelines Committee. Carrier screening in individuals of Ashkenazi Jewish descent. *Genet Med.* 2008; 10:54-6.

8. Tay-Sachs disease. https://medlineplus.gov/genetics/condition/tay-sachs-disease/#causes. Accessed 8 Oct 2020.

9. Grody WW, Thompson BH, Gregg AR, Bean LH, Monaghan KG, Schneider A, Lebo RV. ACMG position statement on prenatal/preconception expanded carrier screening. *Genet Med.* 2013 Jun;15(6):482-3. doi: 10.1038/gim.2013.47. Epub 2013 Apr 25. PMID: 23619275.

10. Grody, W., Cutting, G., Klinger, K. et al. Laboratory standards and guidelines for population-based cystic fibrosis carrier screening. *Genet Med 3,* 149–154 (2001). https://doi.org/10.1097/00125817-200103000-00010

11. Prior TW; Professional Practice and Guidelines Committee. Carrier screening for spinal muscular atrophy. Genet Med. 2008;10(11):840-842. doi:10.1097/GIM.0b013e318188d069

12. "Carrier screening for genetic conditions." Committee Opinion of the American College of Obstetricians and Gynecologists. *Obstetrics & Gynecology.* Number 691, March 2017.

13. Edwards et al. Expanded carrier screening in reproductive medicine-points to consider: a joint statement of the American College of Medical Genetics and Genomics, American College of Obstetricians and Gynecologists, National Society of Genetic Counselors, Perinatal Quality Foundation, and Society for Maternal-Fetal Medicine. *Obstet Gynecol.* 2015 Mar; 125(3):653-62.