After 6 Years: Diagnostic Exome sequencing Slowly Expands to the Non-Geneticists and is Becoming a First-Line Test

Zöe Powis, Yuan Tian, Kelly D. Farwell Hagman, Dajun Qian, Layla Shahmirzadi, Dena Freeman, Sha Tang

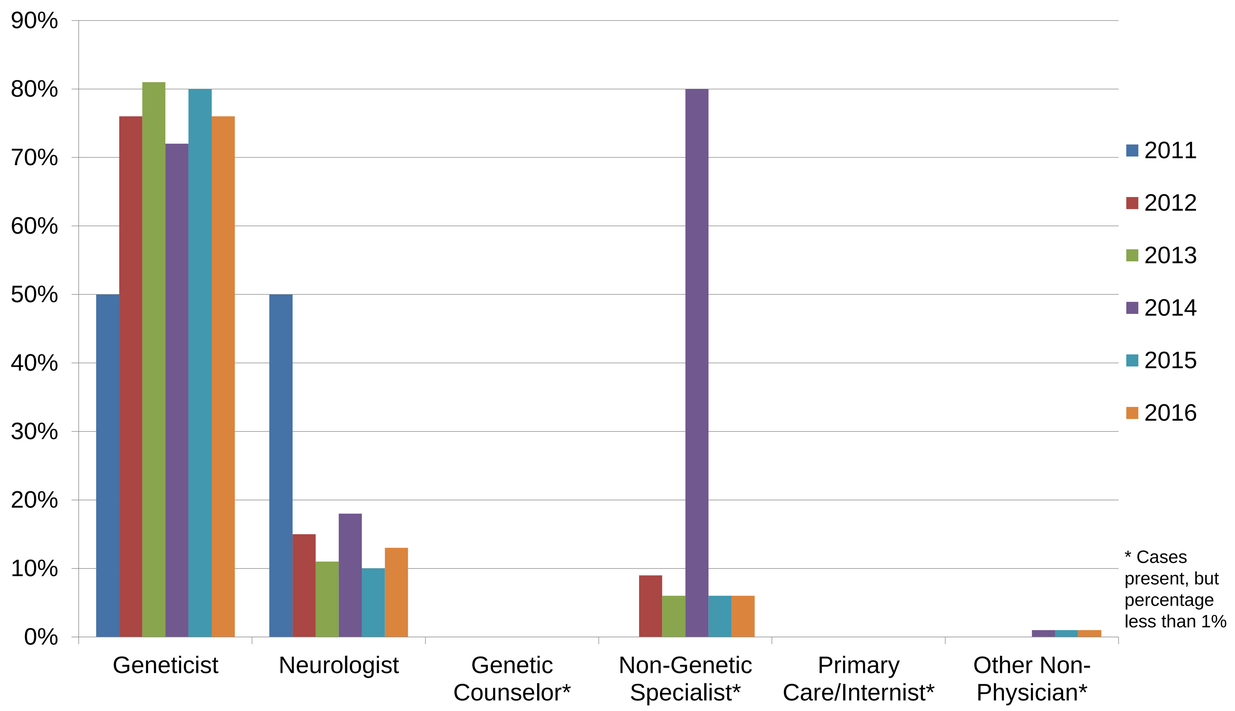
BACKGROUND

- Since Diagnostic Exome sequencing (DES) became commercially available in 2011, a paradigm shift has emerged in the field of genetics in which conditions may be diagnosed based on the test result rather than clinical features.
- This shift has increased the ability of non-genetics professionals to test for and diagnose genetic conditions.
- The increasing knowledge of this test by patients and beyond the field of genetics allows for a variety of health care providers to pursue DES for their patients (Priest, 2017).
- We aimed to assess whether such a shift is also occurring in DES ordering patterns, which would suggest the need for GCs to broaden provider education, communication, and collaborations.

METHODS

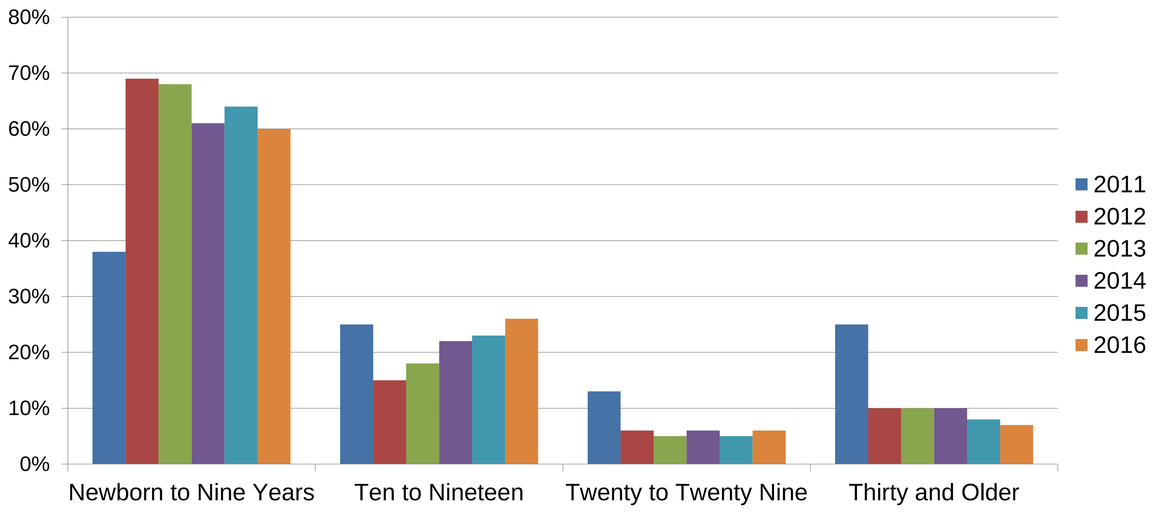
- DES orders from September 2011 to December 2016 were analyzed for:
  - type of ordering provider
  - patient age
  - number of organ systems involved by year.
- Statistical analysis was conducted using Monte Carlo chi-squared test and Kendall correlation.

PERCENTAGES OF DES ORDERING PROVIDER BY YEAR



PERCENTAGE OF ORGAN SYSTEMS INVOLVED IN DES CASES

PERCENTAGE OF PROBAND AGES IN DES CASES



RESULT SUMMARY

- The numbers of exome tests by ordering providers varied from years 2011 to 2016 ($p = 1.0e-5$). The obvious variations include:
  - the tests from geneticist providers were dropped to 72% in 2014 as compared to 81% in years 2013 and 2015,
  - the tests from primary care physicians were increased to 2.4% and 3.3% in years 2015 and 2016, respectively.
- The proband age when evaluated in 4 groups showed variation in last 6 years ($p = 0.01$). This variation was mainly represented by an increased number of tests in younger probands of age <20 (i.e., 83% to 85% in years 2012 to 2014 and 87% in years 2015 and 2016).
- The number of organ systems involved also showed weak increase in last two years (50% and 47% for 4+ organ systems involved in years 2015 and 2016, respectively).

CONCLUSIONS

- This study shows a small increase in the number of non-specialists ordering DES, which may indicate a need for genetic counselors to continue to collaborate beyond their departments and institutions and expand intradepartmental communication.
- The trend towards testing patients with more organ systems involved might indicate that DES is increasingly utilized for more multifaceted phenotypes or that records sent are increasingly more complete as providers realize the need for accurate records in DES analysis.
- The trend toward testing at a younger age may indicate that exome is becoming a first-line test for some types of patients.
- The types of patients undergoing DES are changing as testing becomes more widely known and available, creating a demand for expanded roles of GCs, not only for ordering testing, but also in follow up after others order DES for their patients.

15 Argonaut, Aliso Viejo, CA 92656 Toll Free 866 262 7943 Fax 949 900 5501 ambrygen.com