

Utilization of Genomics to advance the care of chronic disease in diverse populations: Case Study: Hepatitis C

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Disclaimer

- The contents of this presentation are based on data and results of a large sample of patients within the Veterans Administration Health Care system.
- This presentation is the sole property of the authors and does not officially represent the VA health care system.
- The newest group of medications for treatment of Hepatitis C are out and are replacing the use of Interferon and Ribavirin.



Rationale

- **Advancements in genetics can inform health care practices.**
- **Utilizing genetic testing to enhance care is paramount to decreasing the morbidity and mortality of chronic diseases such as hepatitis C.**
- **The following is an example of how genomics is influencing health care.**

Research study

- This presentation is the results of a national review of hepatitis C screening tests utilized within the Veteran's Administration health care system.
- **Dr. Julie Lynch**, one of the co-authors of this presentation/study has been instrumental in establishing access to the use of genetic testing results in treatment of chronic diseases such as Hepatitis C.
- A retrospective review of approximately 2,025 patients who had hepatitis C testing done including the single nucleotide polymorphism (SNP) and genotype testing was the focus of this study.

Overview of VA health care system in the USA-2014

- Veterans health care system was created in 1931 to provide health care services to service members who were transitioning out of the military to civilian life.
- The VA motto is *"To care for him who shall have borne the battle and for his widow, and his orphan."*
Abraham Lincoln
- Currently, there are **8.57 million veterans** enrolled in the VA health care system. 91.7% are male and 8.3% are female.
- The VA health care system currently consists of 152 hospitals and 817 community based outpatient clinics in 50 states and Puerto Rico.

VA statistics on Hepatitis C

- **VA is the largest single provider of medical care for hepatitis C in the USA.**
- **There are approx. 226,000 veterans diagnosed with hepatitis C.**
- **This statistic represents approx. 10% of the veteran population who are infected with hepatitis C.**
- **In the past, only 45% of patients being treated for hepatitis C would respond to traditional therapy.**

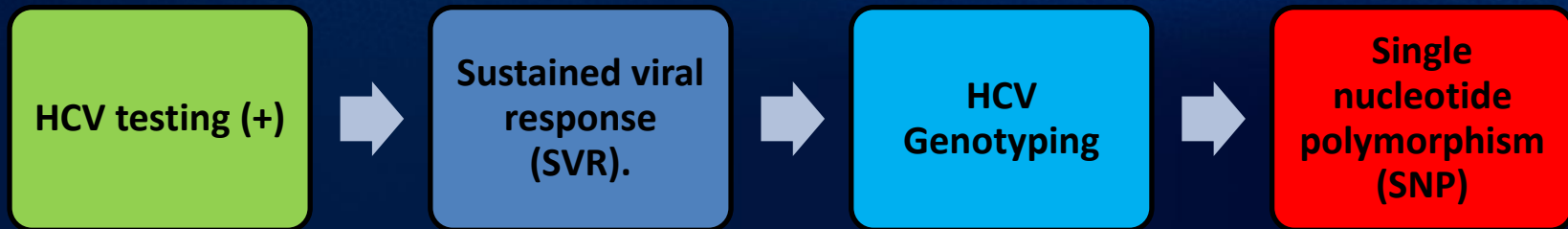
Choice of Traditional drug therapies for Hepatitis C

- Previously, the drug treatment for hepatitis C consisted of two drugs: Ribavirin and Pegylated Interferon (Peg-IFN). These meds must given for up to 48 weeks. Peg-IFN is given by injection weekly.
- Side effects can be significant and include: fever, chills, muscle aches, headaches, oral ulcers, nausea, vomiting and diarrhea, insomnia and depression.
- Many patients refuse to take meds due to side effects and poor response rates or stopped treatment do to side effects.
- **Overall effectiveness of these meds to cure hepatitis C is only 45%.**

Genetic testing and its impact on disease

- In the early 90s, genetic testing became available for identification of viral genotypes of hepatitis C.
- Testing consists of a blood test that will identify one of seven different genotypes of the virus in the infected population.
- HCV Genotyping allows the providers treating Hepatitis C, the opportunity to identify patients who will respond most or least favorably to the previous two drug Hepatitis C treatment.
- The most common type identified is HCV- Genotype 1. African Americans are most likely to belong to this genotype subgroup.

Sequence of Tests for Hepatitis C



Testing for Hepatitis C

- Hepatitis C
- Sustained viral response (SVR)/Load



Genetic testing

- Genomics in the treatment of Hepatitis C includes two aspects: Genotyping of the Hepatitis C virus and identification of a single nucleotide polymorphism (SNP) test . This SNP is known as the Interleukin-28B (IL-28B).
- **Genotyping** identifies which of seven major genotypes of hepatitis C virus: 1-7. Genotype 1 is the most common but is also known to be the most resistant to standardized treatment for hepatitis C.
- **SNP** testing helps to identify the patient's genetic pattern which includes one of these three types: CC, TT and TC. This test is known as the Interleukin-28b or IL28b.
- It is known, that patient's with genotype 1, SNP-CC are most likely to be cured with the current medication regime.

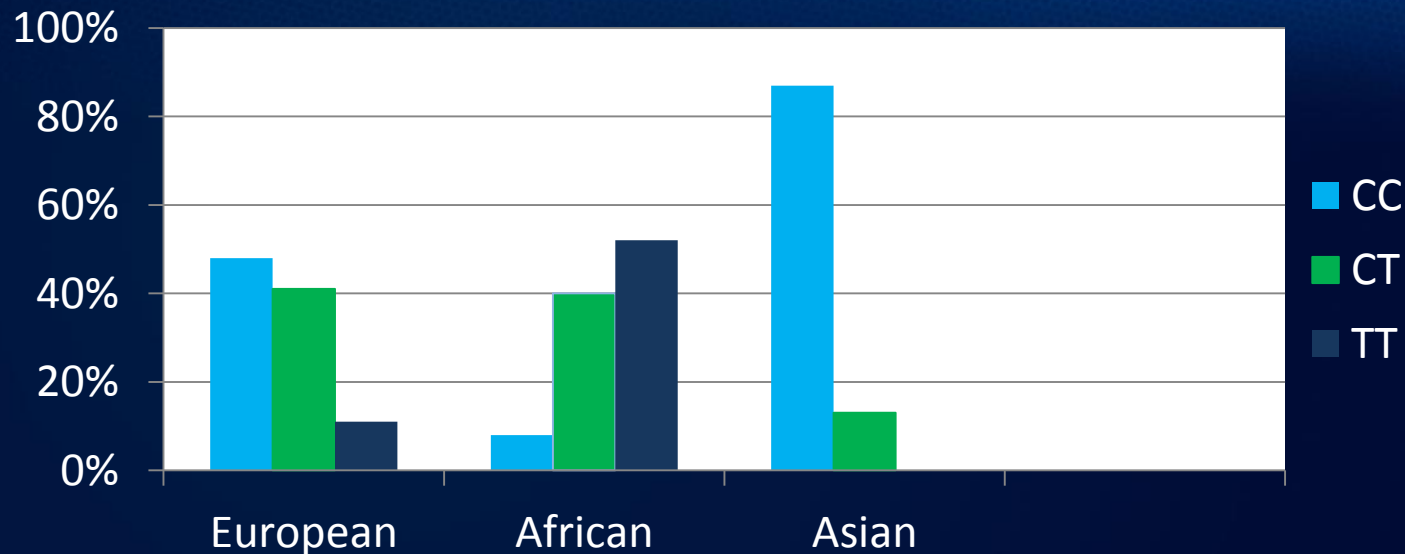
Types of genotypes identified

Genotype: % of HCV infected population in USA		Comments
1	80%	Most common but SVR is < 50%
2	10%	2 nd most common type in USA. Response to 2 drug therapy- good
3	6%	Endemic in Southeast Asia, India, Far East and Australia
4	combined = 4%	Most common in Africa, Middle East and Eastern Europe
5		Most common in South Africa
6		Common in South China, Hong Kong and SE Asia. SVR bet. 50-80%

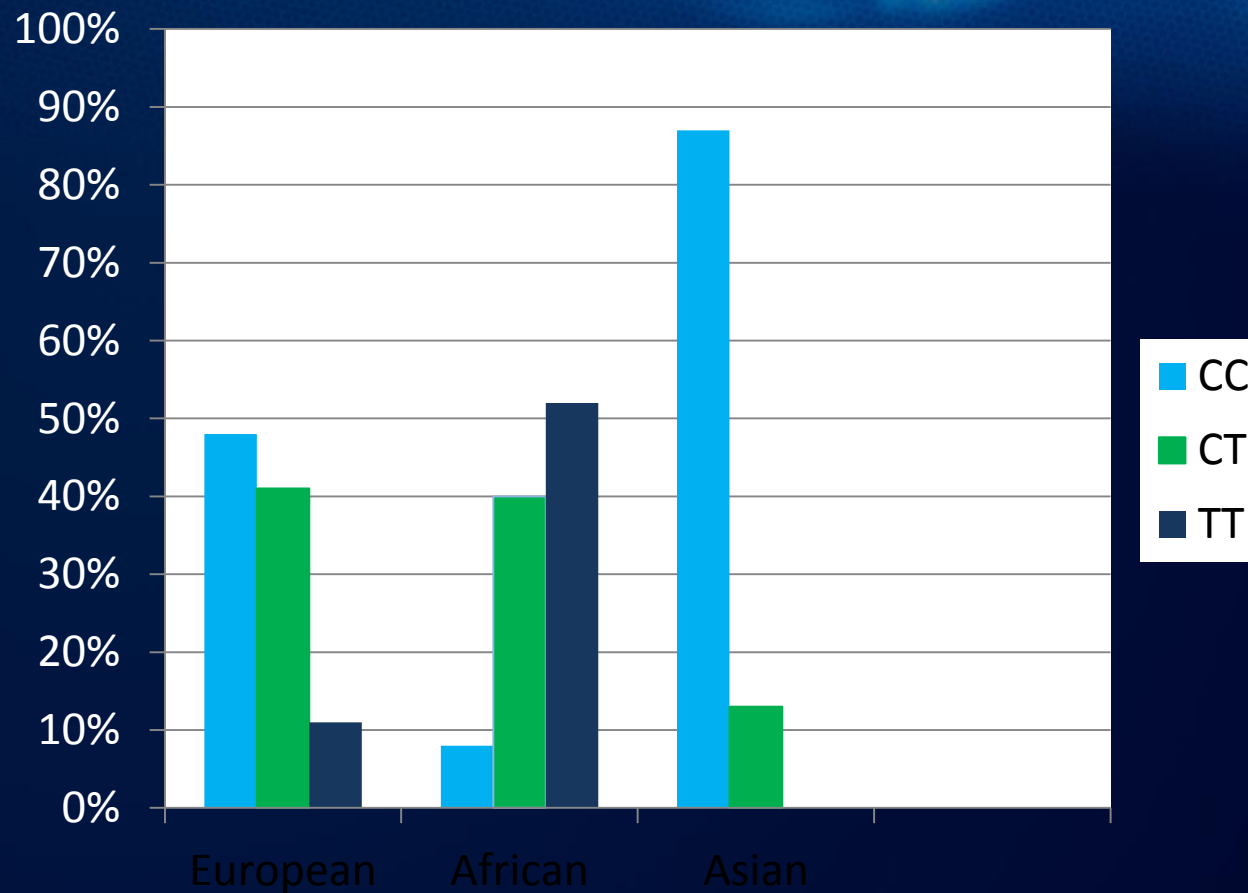
Genotype 1 by race and il28B CC status- * Thomas, et al, 2012)

Ancestry	% likely to have IL28B CC genotype
African	23-55 %
European	53-86 %
South Asian	65-98 %
East Asian	90-100 %

SNP types Identified by Ethnicity in general population with hepatitis C.



Veterans in our study with Genotype 1: and their SNP status.



Customizing care based on genetics

- Prior approaches to treatment involved diagnosing a patient with a disease and treating them with the known med(s) that would help treat the disease or cure them.
- At times it was a “stab in the dark” as we would treat everyone in the same way but the outcome for hepatitis C patients , was less than satisfactory with only a successful response rate of 45% .
- Treatment was often complicated by significant side effects and the treatment period could last up to one year further complicating compliance issues.
- With genetic testing, we can begin to customize treatment to the individual patient not just the disease with much better outcomes.
- With the introduction of the new DAA, the need for Interferon may be eliminated but time will tell.....

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