Sharing Genetic Test Results with People at High Risk of Melanoma to Motivate Behavior Change

Behavior, Risk Information, Genealogy & Health Trial (BRIGHT)

Lisa G. Aspinwall, PhD
Jennifer M. Taber, PhD
Tammy K. Stump, PhD
Danielle Drummond, MA
Wendy Kohlmann, MS, CGC
Marjan Champine, MS, CGC
Pamela Cassidy, PhD
Sancy A. Leachman, MD, PhD

Research supported by the National Cancer Institute, R01 CA158322,
National Center for Research Resources and the National Center for Advancing Translational Sciences, NIH, 8UL1TR000105,
NCI Cancer Center Support Grant 5P30CA420-14,
Utah Cancer Registry, Utah Population Database, & Huntsman Cancer Foundation.

Our Story (with a detective hunt)

- At the start of this project in 2005, controversy about whether it was helpful and ethical to provide melanoma genetic testing to patients
  - Don't people already know they are at risk?
  - Shouldn't they accordingly do everything possible to prevent cancer and/or find it early in its course?
  - Is it ethical to offer testing when it doesn't change management?
- Sancy's clinical experience
  - Is knowledge power?
  - Do patients that receive results comply better with recommendations?

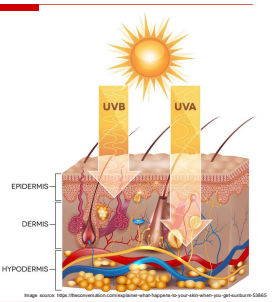
Our Story (with a detective hunt)

- Lisa is studying how people think about health risks
  - But having to make them up to control their experimental properties
  - Studying them among people at population risk, not high risk
  - Genetic testing is interesting because people are perfectly well, yet may have a highly elevated risk they cannot see or modify
- Today, we will share what we have learned in 16 years of asking questions about whether and why genetic testing motivates improvements in prevention behaviors

Melanoma Is Environmental AND Genetic

Melanoma: A cancer of melanocytes (skin cells that make brown pigment and produce a tan when damaged)

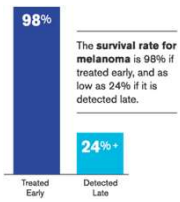
Cause: A combination of an individual's genetic make-up and their environmental exposures to ultraviolet light (both UVA and UVB)



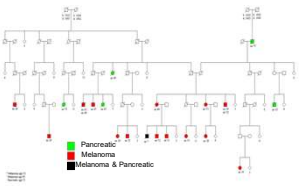
Melanoma Is a Deadly Cancer If Caught Late

Prevention & Early Detection Can Save Lives:

- Sunscreen
- Protective clothing
- Avoidance of UVR
- Self Skin-exams
- Provider Skin-exams



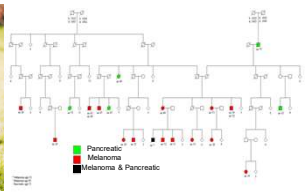
Melanoma Is Environmental AND Genetic



Family History of Melanoma:
Shared family traits:
Common, lower risk genes for UVR *vulnerability* include those for red hair, light skin/eyes

Hereditary Melanoma:
Single gene (e.g., *p16*), High-penetrance, not visible on the outside, very high risk

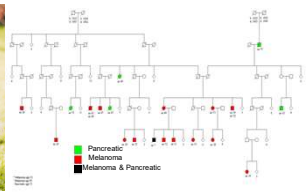
Audience Response Questions



What is the percent chance that a person with red hair will get a melanoma in their lifetime?

What is the percent chance that a person with a *p16* mutation will get a melanoma in their lifetime?

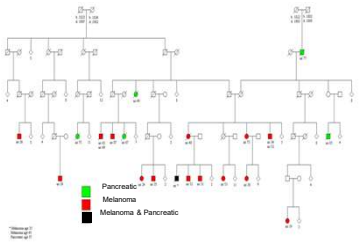
Audience Response Answers



About 4% Lifetime Risk!

About 76% Lifetime Risk!

Audience Response Question



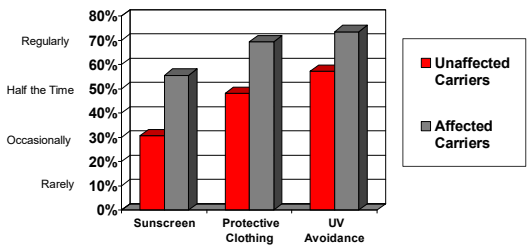
How likely do you think these patients are to follow our recommendations for using sunscreen?

1. **Never**
2. **Rarely**
3. **Occasionally**
4. **Half the time**
5. **Fairly regularly**
6. **Almost all of the time**
7. **All of the time**

Our 1st melanoma genetic test reporting study

- Provided clinical genetic test results to prior research participants, *N*=60
  - 1/3 had prior melanoma diagnosis
  - 2/3 unaffected (no prior diagnosis)
- Why focus on *unaffected* family members?

Baseline photoprotection



In the past 6 months, what percentage of the time would you say that you wore protective clothing (long sleeved shirts **and** long pants) when out in the sun?

Does genetic testing provide benefits?

- In our 1st test-reporting study unaffected carriers reported improvements in…
  - Thoroughness of skin self-examinations
  - Adherence to annual TBSEs
  - Daily routine sun-protection
  - Use of protective clothing
  - Reduced # of sunburns
- These gains sustained at 2-year follow-up
- No increases in anxiety, depression, or worry
- Multiple informational & behavioral benefits
  - Understanding of risk
  - Motivation to practice photoprotection & screening

Aspinwall et al., 2008, 2013, *Cancer Epidemiology, Biomarkers and Prevention*
Aspinwall et al., 2014, *Genetics in Medicine*; A et al., 2013, *Psycho-Oncology*

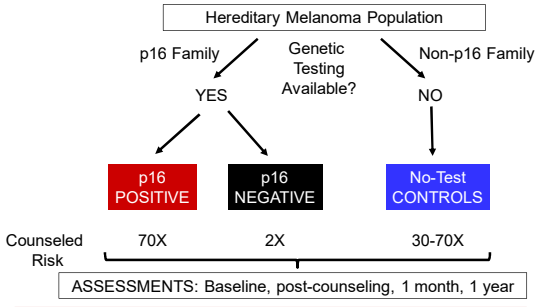
Does genetic testing *really* provide benefits?

- These results cannot distinguish effects of test reporting from those of genetic education & counseling re risk management
- Need to show impact of genetic test reporting > standard recommendations based on family history

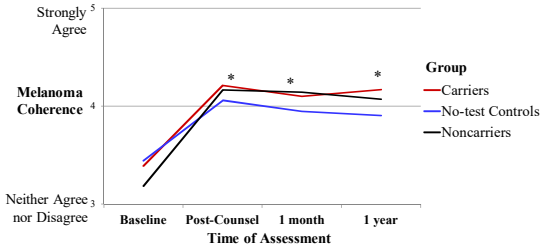
The BRIGHT Project
Behavior, Risk Information, Genealogy & Health Trial

- All study participants are *unaffected* members of high-risk families
  - At least three 1st- or 2nd–degree relatives with melanoma
  - They do not yet have a personal diagnosis of melanoma
- Design
  - Prospective nonexperimental control group
  - Individualized cancer risk assessment with or without genetic testing (no-test controls counseled based on family history)

The Utah BRIGHT Project
Behavior, Risk Information, Genealogy & Health Trial

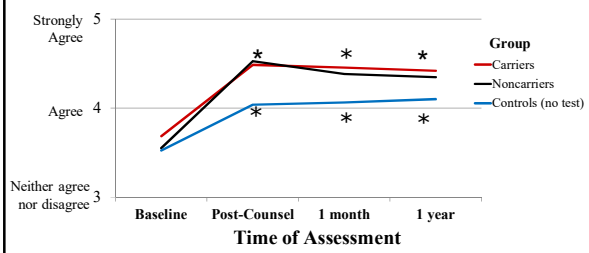


Illness Coherence
"I have a clear picture or understanding of melanoma."



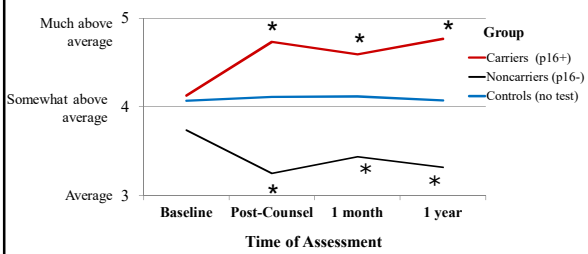
Illness coherence increased over time in all groups ($F(3,324)=7.71$, $p=.0001$). No differences among groups at any assessment. 5 items, alpha = .88

Understanding of melanoma risk (PAGIS)
"I feel certain that I understand the meaning of having this melanoma risk."
"I understand how I came to have this melanoma risk."



Understanding increased over time ($F(3,324)=4.16$, $p=.007$), 6 items, alpha = .89. Both *p16* groups > controls, $F(2,108)=3.13$, $p=.05$. Taber et al., 2015, *J Beh Med*

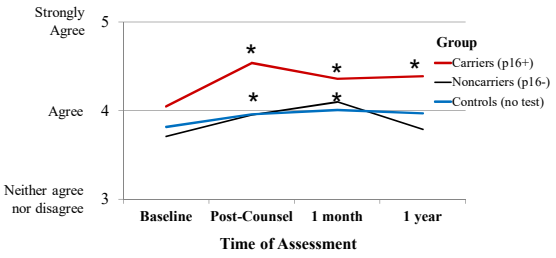
Comparative lifetime risk
"Compared to other people of your age, gender, and skin color, what is the likelihood that you will develop melanoma in your lifetime?"



Group ($F(2,109)=23.22$, $p<.001$); Group x Time ($F(6,214)=6.00$, $p<.001$) Groups differ from each other at all post-counseling assessments.

Urgency & priority of managing risk

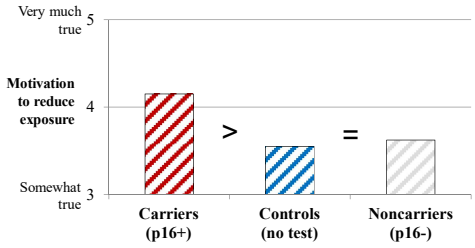
"Dealing with my risk of getting melanoma is a priority to me."
"My risk of getting melanoma is something I need to take action on."



Carriers increased significantly over time, but noncarriers returned to baseline. No change among no-test controls. (Taber et al., 2020, *Annals of Beh Med*)

Motivation to reduce sun exposure

"I am more motivated to reduce my sun exposure."
"I protect myself more from the sun."



Groups significantly different ($F(2,108)=4.06$, $p<.02$.
Carriers > no-test controls & noncarriers, $p<.03$. 4 items, alpha=.87

UVR dosimetry

- Similar to wristwatch
- Worn for 3 27-day periods
- Daily UVR dose @ 10-sec intervals
- Computed standard erythemal dose (SED; J/m^2)
  - For individuals with fair skin, SED of 2 = slight reddening of skin

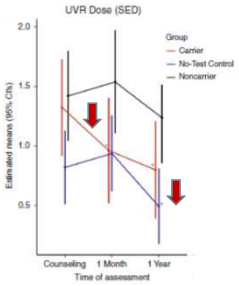
Scienterra dosimeter

Stump et al. (2019), *Genetics in Medicine*

UVR dosimetry

Controlling for age, skin type, seasonality, sex, propensity scores

- Carriers show unique decline 1 month after counseling, $B= -.36$)
- At 1 year, both carriers ($B= -.52$) & controls ($B= -.33$) show significant decrease in average daily UVR exposure



Reflectance spectroscopy

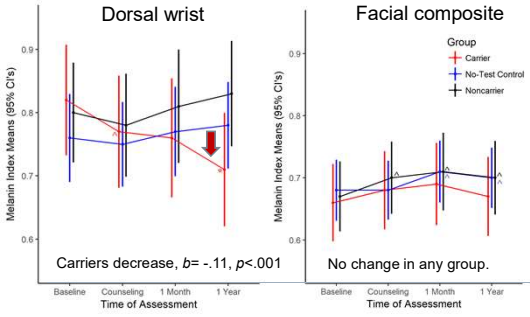
measures skin color at typically exposed sites

Minolta Chroma Meter

Stump et al. (2019), *Genetics in Medicine*

Melanin Index Scores via reflectance

Controlling for age, skin type, seasonality, sex, propensity scores



Carriers decrease, $b= -.11$, $p<.001$

No change in any group.

Understanding the impact of genetic testing on the management of familial cancer risk