

Accelerometers & Genetic Testing

The Rest of the Story

Hank George, FALU

What is an accelerometer?

FitBit trackers use an accelerometer to turn movement into digital measurements.

By analyzing acceleration data they provide detailed information about frequency, duration, intensity and patterns of movement to determine your steps taken, distance traveled, calories burned and sleep quality

paraphrased from definition at www.fitbit.com

Is the use of accelerometers in life insurance a sales gimmick, a valid mortality resource...or perhaps both?

Does moderate-to-vigorous physical activity improve mortality?

- Each 2,000 step per day increment is associated with a 10% reduction in risk of CV event ¹
- Increasing baseline daily steps from sedentary to 10,000/day was associated with 46% reduction in mortality ²
- Adjusted mortality in 4th quartile of physical activity measured by accelerometer was 0.37 vs. 1st quartile ³

The answer is YES – as we have known for decades!

¹Yates. The Lancet. 383(2013):1059

²Dwyer. PLoS One. 10(2015):e0141274

³Evenson. American Journal of Epidemiology. 184(2016):621

“Activity trackers, either alone or with cash incentives, do not seem to improve health outcomes at 12 months.

A similar study published in JAMA found that people who wore a fitness device lost less weight over 2 years than those who self monitored their diet and activity.

We saw a large drop off in usage as the study went on.

People use these devices for a while, but with time the novelty wears off – this is consistent with how people use trackers in real life.”

As cited by Jacqui Wise

“Activity trackers, even with cash incentives, do not improve health”

Research News

British Medical Journal

355(2016):i5392

“...wearable devices seem to appeal to groups that might need them the least,” as revealed in a study where “more than half of individuals who purchased a wearable device stop using it...”

Mitesh S. Patel, MD, MBA, MS
University of Pennsylvania Medical Center
Journal of the American Medical Association
313(2015):459[editorial]

In a new study:

“Healthy participants averaged 76% weekly use vs.16% in those with chronic illnesses...and adherence declined in all participants during the study.”

Shaw. Journal of the American Medical Informatics Association. 23(2016):462

In a meta-analysis of 12 studies involving 1458 diabetics using accelerometers or pedometers:

“...no significant differences were observed in HbA1-c, BMI, blood pressure or lipid profile.”

They did not improve any aspect of clinical outcome.

An in-depth study found that the FitBit Flex has “**limitations**” that adversely affect its measurements of “**physical exercise attributes in free-living conditions.**” ¹

Another revealed it has only “**moderate validity**” for measuring physical activity when correlated with direct observation. ²

¹Dominick. JMIR mHealth and uHealth. 4(2016)e110

²Sushames. PLoS One. 11(2016):e0161224

Connell discovered that accelerometers “register a significant number of false steps per minute” because “non-stepping physical activities can result in false detection of steps.”

Such as washing and drying dishes!

Schrack found that “wrist measurement is particularly problematic because any type of upper body movement may be classified as steps.”

Individual accelerometer use is
subject to HIPAA regulation because
its output is classified as
Protected Health Information

Consumer advocates are already voicing concern:

“Wearables give life insurers the opportunity to gather amazing amounts and new types of data about customers... behavioral data that will transform...pricing in the future”¹ ...

How will New York State’s probe of novel life underwriting paradigms judge their appropriateness in risk appraisal?

The same as personal purchase records?

Which will be thumbs down!

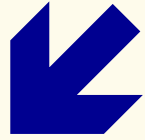
¹Pauli. Op.Cit. 17

Bottom Lines

- Accelerometers in life insurance = marketing gimmick
- Accelerometer step counts can be altered by users
- Persistent use is limited to preferred or better risks
- Accelerometer data on personal choices that will be viewed negatively by regulators
- Accelerometers will not significantly impact mortality

**Genetic Testing
&
Life Underwriting**

Critical Distinction



Germline

Inherited

Somatic

Not Inherited

Genetic Testing in Perspective

As of 4/27/17, the NIH Genetic Testing Registry “contained information on 49,521 tests conducted at 492 laboratories for 10,733 disease conditions involving 16,223 genes.” ¹

Nevertheless...

“Two recent systematic reviews show an insufficient evidence base for large-scale implementation of genomic medicine...we found a very limited body of evidence about the effect of using genomic tests on health outcomes.” ²

Muin J Khoury, MD, PhD
CDC
JAMA
318(2017):27[editorial]

To what extent do germline mutations impact disease prevalence and outcomes?

Coronary Artery Disease

- All 62 validated CAD risk loci plus more than 100 as yet non-validated loci “account for 15% of the heritable likelihood of having clinically manifest CAD” ¹
- Odds Ratios for multivessel CAD in ACS survivors: ²

Diabetes	2.03
Hypertension	1.64
Family History	1.61
Smoking	1.59
High GRS*	1.41

*GRS = Genetic Risk Score

¹Kovacic. Journal of the American College of Cardiology. 69(2017):837[editorial]

²Hindieh. Arteriosclerosis, Thrombosis and Vascular Biology. 36(2016):1286

Coronary Disease Event Risk

In the Atherosclerosis Risk in Communities, among subjects deemed at high genetic risk, 10-year coronary event rates were 10.7% in those with an unfavorable lifestyle...

... but only 5.1% if their lifestyle was favorable lifestyle!

Similar major differences were found in the Women's Genome Health Study and Malmo Diet and Cancer Study.

New England Journal of Medicine. 375(2016):2349

How about Diabetes?

“At this time, there are few if any actionable genomic findings in diabetes that are ready for implementation”¹

“Obese persons with the lowest genetic risk for diabetes were nearly 5 times more likely to develop the disease than normal-weight persons with the highest genetic risk.”²

¹Floyd. Diabetes Care. 39(2016):1858

²Burke. Annals of Internal Medicine. 164(2016):564[editorial]

Elderly

In 1229 Swedes ≥ 70 followed 25 years, variations in 4 genes increased mortality by up to 62%. However – regardless of genetic risk – those with a favorable risk behavior profile had 64% lower mortality than those with a high-risk profile (= 2 or more adverse factors present)¹

Major Depression

“A study of more than 76,000 major depressive disorder cases and controls from combined data sets – the largest ever genetic study of a condition – turned up zero genetic associations”²

¹Rizzuto. Journal of the American Geriatrics Society. 64(2016):2440

²Abbasi. Medical News and Perspectives. JAMA. 317(2017):14

Bottom Line

“Genetics determine just 30% of a person’s health; the other 70% is a combination of behavior, environment and other factors”
based on a 2015 report by the Kaiser Family Foundation.

Ho. *“Insurers help make genetic testing widely available”* San Francisco Chronicle. May 15, 2017

BRCA 1 and BRCA 2 Germline Multi-Cancer Gene Mutations

- Lifetime breast cancer risk > 90%¹
- In US, only 10% with BRCA mutations are aware they carry them²
- Saliva-based BRCA test kits are available via Amazon.com starting at \$199

¹Kuchenbaecker. JAMA. 317(2017):2402

²Cragon. Cancer. 123(2017):2497

“Currently there is no legal protection from genetic discrimination by life and long-term care/disability insurance companies.

In this regard, an important part of the [BRCA] pretest counseling process is to encourage the patient to consider whether they wish to purchase life or disability insurance for themselves or their children before testing”

Dana Meaney-Delman, MD
Emory University School of Medicine
Obstetrics and Gynecology Clinics of North America
40(2013):475

BRCA Bottom Lines

Good News

The majority of young and middle age females testing BRCA positive opt for prophylactic bilateral mastectomy.

Bad News

- Those who don't are at high BC risk despite surveillance.
- They are also at high risk for ovarian carcinoma – which can be prevented by bilateral prophylactic oophorectomy, with the caveat that there is increased mortality in surgical menopause under age 45.
- Plus increased risk for pancreatic and other cancers.

Myth

“Direct-to-consumer testing, I don’t see as an issue to the insurance industry. It raises awareness and is likely good for insurance. This is leading people to health, which is in the best interests of insurers.”

Medical Director, speaking at LIMRA Research and Marketing Conference, June 2017

See *On The Risk* 33,1(2017):63 for same basic message from another prominent medical director

Reality

Cambridge researchers poured over 10,515 abstracts including 18 studies that reported on the impact of telling people their genetic risk of disease on risk-reducing health behavior.

After examining multiple behaviors including smoking, physical exercise, alcohol use, etc., they concluded that **“communicating DNA based disease risk estimates has little or no effect on risk-reducing health behavior.”**

Holland. British Medical Journal. 352(2016):i1102

23andMe

Much Ado About Nothing in Life Underwriting

- FDA approved the 23andMe 10-component DTC genetic test profile
- FDA also agreed to approving DTC-GT profiles on a fast-track basis¹
- Most disorders covered in 23andMe are rare
- One of potential concern is hereditary hemochromatosis, which can cause iron overload of vital organs leading to cirrhosis, refractory diabetes, liver cancer, etc.
- However, when the causative gene's impact “was studied in large populations, the chance that carriers expressed hemochromatosis was revised from more than 80% to less than 1%”²

¹Wynn. Annals of Internal Medicine., 167(2017):125[editorial]

²Manrai. JAMA 315(2016):1233[editorial]

Do consumers share DTC-GT results with their doctor?

“In prior studies, 20%-30% of DTC personal genome testing consumers reported sharing their results with a physician.”

Then, in a 1026-subject study by the Impact of Personal Genomic Study Group (Boston), 63% said they planned to do this but 6 months later only 27% reporting having done so.

Bottom line: most DTC-GT results, like other DTC test findings, will not be found in medical records!

GWG is in the Secondary (Settlement) Market

- They plan to introduce saliva-based DNA methylation testing into the life insurance industry. ¹
- Research by Horvath et al shows that “DNA methylation age” based on blood testing predicts mortality later in life. ²
- DNA methylation is a somatic – not germline – gene-related test.³
- It has been shown to be associated with both CV and cancer risks...but whether it can be done effectively within constraints imposed by life underwriting remains to be determined. ⁴

¹LOMA Resource. April 2017:25

²Data cited at Genetic Research online site via personal communication from D. Kilbo; 3/17/17

^{3,4}van der Harst. Journal of the American College of Cardiology. 70(2017):590

⁴Qu. Cancer. 123(2017):2472 and many other studies

Major Market Insurance Industry Positions on Genetic Testing in Life Underwriting

- The ABI (Association of British Insurers) has agreed that applicants do not have to disclose genetic test results up to a face amount accounting for over 97% of applications¹
- Aussie insurers have agreed to abstain from initiating genetic testing but they may request all existing genetic test results¹
- Canada just passed Bill S-201, which prohibits genetic discrimination in life underwriting²

¹ O'Leary. Hot Notes. August 2013: 4

²Online Library of Parliament. 42nd Parliament, 1st session

Do we have an industry policy on genetic testing for life underwriting?

Allegedly...but I can't find a published statement.

What would I advise if asked by a consumer about about our policy on genetic testing?

Ask the ACLI

Bottom Lines

- DTC testing and the absence of cotinine screening on accelerated underwriting are the 2 greatest antiselection threats in underwriting history.
- The impact of DTC testing is magnified because the Interstate Compact forbids asking about having medical tests other than as ordered by a healthcare provider.
- For now, genetic testing poses no major risk to life insurers
- Some day it could!

Epilogue

***“A lot of companies
are sleepwalking into
a buzzsaw”¹***

¹Comment by delegate at SOA Underwriting Seminar (Chicago, August 2017). Peter Maynard (SelectX UK). Personal communication.