Editorial

A Gift From the Heart for Years to Come

As you gather with family and friends to share another holiday season, consider a gift that you could give those you love and care about: the gift of a life lived to its fullest duration instead of one cut short by health problems. This gift has some unique attributes: it can be life-extending, its benefits can be shared without limitations, and, despite its capacity for unlimited sharing, it is intrinsically tailored to the benefits that each individual most needs. The gift I am referring to is the ability to determine one's "heart age" and to identify factors in one's personal health history that are affecting the risk of incurring a major cardiovascular event. Because cardiovascular disease (CVD) remains the primary source of morbidity and mortality in the United States, anything we can do to mitigate its toll on those we care for in critical care as well as those we care about at home is worthwhile. Determining heart age affords a means of going beyond merely discussing risk factors for CVD to calculating the impact of one's personal set of determinants on the risk of experiencing a potentially lethal cardiovascular outcome. In the interactive versions of these calculations, users can immediately see quantitative ramifications of modifying risk factors on the likelihood of that outcome.

The Concept of "Heart Age"

Heart age is defined as "the predicted age of a person's vascular system based on their cardiovascular risk factor profile."[1] The concept was introduced in 2008 with publication of the Framingham Heart Study[2] as an alternative to the 10-year risk score then used to describe cardiovascular health risk. The comparison of calculated heart age to one's actual chronological age can characterize a person's risk for incurring a CVD event. In this context, a *CVD event* includes development of any of the following disorders: coronary heart disease (angina, coronary insufficiency, myocardial infarction, coronary death), heart failure, cerebrovascular disease (transient ischemic attack, ischemic stroke, hemorrhagic stroke), or peripheral artery disease (intermittent claudication).[1] The hope is that this metric will translate into more meaningful and motivating terms that transform high-risk into heart-healthy behaviors associated with longevity free of major negative CVD outcomes.

When heart age is compared to chronological age, one of 3 possible findings will be observed: (1) Heart age is **equal to** chronological age, representing a **normal** risk for CVD events for someone that age; (2) heart age is **less than** chronological age, reflecting a **lower** risk; or (3) heart age is **greater than** chronological age, signifying a **higher** risk for those events for someone that age.[3] An

Table Differences in Grif's predicted heart age and risk using different calculators

Heart age calculator	Predicted heart/vascular age	10 year risk of CVD
CDC: Heart Age Predictor Using BMI[8]	6 years less than chronological	7.3% (9.2% normal for my age)
CDC: Heart Age Predictor Using Lipids[a6]	10 years less than chronological	5.7% (8.2% normal for my age)
Local hospital's Heart Health Profiler[7]	19 years less than chronological	5.9% (low for my age)
Average	11.66 years less than chronological	6.3%

Abbreviations: BMI, body mass index; CDC, Centers for Disease Control and Prevention.
[a] Replaces BMI with high-density lipoprotein and total cholesterol values.

additional term, *excess heart age,* has also been coined to describe the magnitude of the spread or difference between the heart age and chronological age.[4]

From these 3 possible associations between heart age and chronological age, we can formulate the health goal related to each:

- When heart age equates to chronological age, the goal is to continue the behaviors that have kept cardiovascular risk factors in check and prevented increased risk. Because advancing age will continue to raise risk, however, it would be best to seek means to offset that risk by improving upon factors such as exercise or diet.
- When heart age is less than chronological age, the goal is to continue to optimize the heart-healthy behaviors that reduce risk of CVD events.
- When heart age exceeds chronological age, the goal is to identify all contributing factors and follow a plan targeted to significantly diminish their influence in heightening CVD risk.

Components of Heart Age

In the Centers for Disease Control and Prevention (CDC) study reported in September 2015,[1] the research team predicted heart age by employing the Framingham Risk Score (FRS) first described 7 years earlier in the Framingham Heart Study.[2] The FRS incorporates the following self-reported risk factors:

- chronological age
- current smoking status
- use of antihypertensive medication
- diabetes mellitus status
- body mass index (BMI)

In addition to these self-reported variables, the CDC study included an estimate of systolic blood pressure via an algorithm described by the senior author.[5]

Other means of predicting heart age include measured laboratory values for total cholesterol and high-density lipoprotein cholesterol.[6] In addition to these 6 variables, my local hospital's heart age calculator[7] solicits many others, including exercise, stress, family history, CVD history and procedures, and having a primary care physician. As you might expect, using different heart age calculators that employ different attributes or numbers of attributes can produce different results.

As the Table indicates, when I used the CDC's calculator that includes BMI,[8] it predicted a heart age considerably lower and a 10-year risk higher than the CDC calculator that uses lipids rather than BMI.[6] The local hospital's calculator[8] estimated my heart age to be 3 times lower than the CDC's BMI version with a 10-year risk of CVD comparable to the CDC's lipids version. The lesson here is that the absolute numbers generated for heart age and risk of CVD may be closely tied to the calculator and to the individual's specific risk factor values.

Clinical Relevance of Heart Age

This recently published CDC study[1] has received considerable attention since its release because it represents the first national study to determine heart age for adults aged 30 to 74 years in the United States. In addition, the sample of 236 101 men and 342 424 women, each gender with a mean chronological age of 48 years, has afforded a wealth of data related to heart age and identified a number of statistically significant disparities in heart age related to gender, race, geographic location, and other demographic attributes. A brief synopsis of those findings follows.

General Findings

- Overall, US adults have heart ages 7 years older than their chronological age.

- A substantial majority (nearly 70%) of Americans have a predicted heart age older than their current age.

Heart Age and Gender

- One in 2 men and 2 in 5 women have heart ages 5 or more years older than their actual age.
- For men, the mean heart age was 7.8 years older and for women, 5.4 years older.

Heart Age and Race/Ethnic Group

- Although heart age exceeds chronological age for all racial/ethnic groups, it is highest among black men and women (mean, 11 years older for both).
- Black men had heart ages 3 to 4 years older than Hispanic and white men; black women had heart ages 5 to 7 years older than white and Hispanic women.

Heart Age and Excess Heart Age

- More than 69 million (43.7%) US adults aged 30 to 74 years had excess heart age of greater than or equal to 5 years.
- Prevalence of excess heart age greater than or equal to 5 years was 48.8% among men and 38.5% among women. For both genders, prevalence was higher among blacks, increased with age, and decreased with higher education and income.

Heart Age and Geographic Location

- Average heart age differed geographically with higher heart ages in southern US states.
- Excess heart age was lowest in Utah for both men (5.8 years) and women (2.8 years) and highest in Mississippi for both men (10.1 years) and women (9.1 years).
- Five states with the highest percentage of adults with heart ages 5 or more years older than their actual age were Mississippi, West Virginia, Louisiana, Kentucky, and Alabama.
- Five states with the lowest percentage of adults with heart ages 5 or more years older than their actual age were Utah, Colorado, California, Massachusetts, and Hawaii.

Heart Age and Education and Income Level

- For both genders, excess heart age increased with age and decreased with higher education and household income levels.

Heart Age and Systolic Blood Pressure

A systolic blood pressure (SBP) less than 120 mm Hg has a dramatic beneficial effect on excess heart age for both genders:

- For men, an SBP less than 120 mm Hg was associated with a mean excess heart age of 1.8 years; an SBP of 120 to 139 mm Hg was associated with a mean excess heart age of 10.5 years; an SBP greater than or equal to 140 mm Hg was associated with a mean excess heart age of 20.6 years.
- For women, an SBP less than 120 mm Hg was associated with a mean excess heart age of -1.2 years; an SBP of 120 to 139 mm Hg was associated with a mean excess heart age of 12.2 years; an SBP greater than or equal to 140 mm Hg was associated with a mean excess heart age of 18.8 years.

Implications and Applications for Critical Care Nurses

The CDC recommends[9] that health care providers help disseminate the value of this new parameter by determining, documenting, and counseling all patients aged 30 to 74 about heart age and demonstrating the effects of risk factors on premature aging of their heart; assisting patients to select 1 or 2 risk factors to improve first; identifying community resources such as smoking cessation classes or diabetes support groups to support necessary lifestyle changes; and ensuring they take medications as prescribed.

Conclusion

As the CDC study data confirm, there has been limited success in convincing Americans to modify their lifestyles to diminish their risk of major CVD events. The concept of heart age was designed to simplify and facilitate understanding of CVD risk factors in a manner that would motivate the public to make those changes. Although it may not be fruitful to introduce your family and friends to the benefits of optimizing their heart age as you share your bountiful holiday meals together, when the conversation moves on to the approaching new year and resolutions that need to be made, that may be an opportunity to share the powerful possibilities that learning how to calculate and apply the notion of heart age can provide. Take the time to explain what heart age is, how to determine it, and the striking effect of reducing one or more risk factors on premature aging

of the human heart. I don't know what your holiday gift list will include, but I can pretty much guarantee that nothing on that list conveys the promise of helping to ensure that all those who you most want to share next year's holidays with will still be able to do so. Give them this means to improve their health and extend their life so they can be there for you for many years to come. CCN

JoAnn Grif Alspach, RN, MSN, EdD
Editor

References

1. Yang Q, Zhong Y, Ritchey M, et al. Vital signs: predicted heart age and racial disparities in heart age among U.S. adults at the state level. *MMWR.* 2015;64(34):950-958. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6434a6.htm?s_cid=mm6434a6_w. Accessed September 30, 2015.
2. D'Agostino RB Sr, Vasan RS, Pencina MJ, et al. General cardiovascular risk profile for use in primary care: the Framingham Heart Study. *Circulation.* 2008;117(6):743-753.
3. Centers for Disease Control and Prevention. Analyzing America's Heart Age. http://www.cdc.gov/media/dpk/2015/dpk-vs-heart-age.html. Accessed September 28, 2015.
4. Lowes R. Heart age tops actual age in the United States. Medscape, September 1, 2015. http://www.medscape.com/viewarticle/850384_print. Accessed September 28, 2015.
5. Yang Q, Zhong Y, Ritchey M, et al. Predicted 10-year risk of developing cardiovascular disease at the state level in the U.S. *Am J Prev Med.* 2015;48:58-69.
6. Framingham Heart Study. Cardiovascular Disease (10-year risk), Risk Score Calculators, Interactive, Using Lipids. http://www.framinghamheartstudy.org/risk-functions/cardiovascular-disease/10-year-risk.php. Accessed September 29, 2015.
7. Anne Arundel Medical Center, Heart & Vascular Institute. Heart Health Profiler. http://www.aahs.org/heart/. Accessed September 29, 2015.
8. Framingham Heart Study. Cardiovascular Disease (10-year risk), Risk Score Calculators, Interactive, Using BMI. http://www.framinghamheartstudy.org/risk-functions/cardiovascular-disease/10-year-risk.php. Accessed September 29, 2015.
9. Centers for Disease Control and Prevention. VitalSigns. Heart Age—Is your heart older than you? http://www.cdc.gov/vitalsigns/heartage/. Accessed on September 28, 2015.