Analyzing Cardiovascular Disease Risk Assessments: Improving Cultural Competence for Asian Americans

Aarti Chaudhary

Abstract

Cultural competency in healthcare, specifically cardiology, needs to be improved because of inaccurate information about screening processes, which doesn't help many ethnicities. The Atherosclerotic Cardiovascular Disease (ASCVD) risk calculator is commonly used in primary care offices to determine whether or not someone should be taking extra precautions to avoid disease. The primary groups that research has previously focused on to prove the effectiveness of the calculator were white, black, and Hispanic groups. Though other ethnicities were considered, they were all grouped into an "Other" category, so the actual effectiveness is not shown. As a result, other patients may get inaccurate information about their risk for cardiovascular diseases and suffer more. This paper will review current research on different cardiovascular disease risk assessments and analyze whether or not they are accurate for the Asian American population. By researching other calculators that can help Asian Americans, and using the ASCVD risk calculator as a benchmark, the paper will be able to help improve healthcare.

Introduction

Cardiovascular disease has one of the highest mortality rates in the U.S. One person dies every 33 seconds, and an average of 17.9 million people globally die every year (WHO, 2023; CDC, 2023). Asian people, as an overall group, are more likely to be misdiagnosed when presenting with any of these diseases, which can be due in part to cultural incompetency. This is an especially important problem because of the high prevalence of this disease in Asians, with South Asians themselves already making up 60% of the world's heart disease patients (Krishnan, 2019). Despite the high-risk factors for Asian Americans, there are very few tools available to help diagnose this population in the United States. The risk factor calculators that currently exist, and that are very frequently used in practitioner's offices, are based primarily on research in white, black, and Hispanic populations. Though calculators like the Atherosclerotic Cardiovascular Disease (ASCVD) Risk Calculator help a lot of people with getting diagnosed and receiving help so they don't die from the illness, it still misses out on a whole group of people.

The trials done to test out the effectiveness of the ASCVD Calculator focused primarily on the groups of people listed previously, with there being somewhere from 1,984,000 - 18,175,000 white people tested; 60,000 - 1,921,000 African American people tested; and 164,000 - 3,293,000 Hispanic people tested. All other races and ethnicities were grouped into an 'Other' category, which contained only 49,000 to 1,757,000 people, shown in the results done for the 2013 American College of Cardiology/American Heart Association Practice Guidelines (Goff et al., 2013). There is an extreme lack of risk assessments that cater to the different genetics of Asian people. This could be connected to the lack of understanding and awareness of how people of different races have different risks and ways to be treated.

Cultural competency in healthcare overall refers to the ability of practitioners to provide care to all patients with diverse values, beliefs, and behaviors. In addition, it refers to the ability to change the delivery of healthcare, if needed, to meet patients' social, cultural, and linguistic needs (AHA, 2013). Recognizing that Asian people in the U.S., or in any predominantly white

country, may not meet the same criteria as those of the average person in the nation is the first step towards this type of awareness. To improve care in the cardiology field, there needs to be more devices that take into account factors that affect all people in the country, rather than just the majority of the population. While the ASCVD Risk Calculator is used in 41% of primary care offices, there are other calculators out there that may more accurately diagnose cardiovascular disease in the Asian American population (Ramsey, 2021).

The purpose of this paper is to analyze different existing cardiovascular risk assessments that are either in use or in a pre-approval state but have still been sufficiently researched. While doing this, factors such as what races were accounted for in the trials, the accuracy rate of diagnosis, the frequency rate of use in primary care offices, and the overall impact on the whole U.S. population will be taken into account. With all of this information, the paper will hopefully effectively find a risk assessment that works best for the Asian American population. This study also aims to boost awareness of the need for cultural competence in cardiology, and all fields of healthcare, as the different norms of different cultures need to be considered if healthcare practitioners want to be helping people to the best of their ability.

Methods

For this study, the search term “ASCVD Risk Calculators” was used in the search engine PubMed. Using that basic field, thousands of articles are obtained. The results were further narrowed down using filters. These filters were clinical trials, meta-analyses, and review papers. By doing this, digestible papers were found that gave all the information and data necessary to make any connections. These included quotes like “ASCVD,” “Risk Assessment,” and “Cardiovascular Risk.” This yielded 1,557 results in total. After that, to find more calculators specifically for Asian populations, the search terms “cardiovascular risk calculators for Asians,” as well as “Asian Risk Calculator,” and “Asian Cardiovascular Risk Calculator,” were used. This also gave numerous results, which were narrowed down using the filters clinical trials, meta-analyses, and review papers. After being filtered, 48 results were found. Finally, articles identified as relevant after the title and abstract were reviewed and included in this article for full-text review.

Results

AECRS1.0/AECRS2.0

AECRS1.0 is a cardiovascular and stroke risk calculator that is said to be more effective than others currently on the market. While being compared to other risk calculators, it was said to have scored the largest area-under-the-curve (AUC) value, at 0.927. The higher that this AUC value is the better the calculator performed with the highest value being a 1.0, showing the high effectiveness of AECRS1.0. The cohort used in the trials for testing AECRS1.0’s efficiency consisted of 202 Japanese patients from Toho University, Japan (Khanna et al., 2019). Though this is a fully Asian group, it still only accounted for one out of many ethnicities, making this only proven to be effective for Japanese people.

An existing cardiovascular risk assessment that claims to be more effective than its predecessor is AtheroEdge Composite Risk Score 2.0, or AECRS2.0. This is the improved version of the initial model, AECRS1.0, which didn’t account for chronic kidney disease. The primary reason for the making of this assessment was to improve it from the first version so that it could predict more types of cardiovascular diseases. In the clinical trials for testing this model, 339 South Asian Indian patients were analyzed. Of these patients, 250 were male and 89 were

female (Viswanathan et al., 2020). Though the whole testing group is South Asian, which differs heavily from other calculators such as the ASCVD Risk Calculator, there is still only a main focus on one population. Therefore, this cardiovascular risk assessment is only catered towards one group of people, and can't be proven to help different ethnicities and cultures.

To show the accuracy rate of AECRS2.0, the makers benchmarked it against another risk calculator that also accounted for chronic kidney disease in testing. This calculator was called QRISK3. The area-under-the-curve, AUC, value for AECRS2.0 was higher than the value of the QRISK3 calculator by about 74% (Jamthikar et al., 2020). Though not tested with people of different ethnicities, AECRS2.0 serves its purpose in its country of origin, India, and accounts properly for chronic kidney disease. Whether it can be used for checking other cardiovascular diseases is unknown. Despite all of this, there has been no use of this calculator in primary care offices, so its accuracy in diagnosing people of any sort of disease on a regular basis is also unknown.

QRISK3

The QRISK3 calculator is a revision of an existing calculator, the original QRISK that was developed and approved for primary care offices in 2007. The new version, QRISK3, was published in 2017 with the goal of including more risk factors to be more accurate for a wider range of cardiovascular diseases. It was particularly made and noted to predict cardiovascular disease at a higher accuracy in people with systemic lupus erythematosus (SLE). In this trial, there is a noted greater number of factors considered for QRISK3 compared to other risk calculators like ASCVD, Framingham, and PREDICTS. QRISK3 takes in 20 different factors compared to 13, 7, and 7 factors for the other calculators, respectively (Zhu et al., 2022).

In this study's trial, there were 366 patients in the whole cohort, and there was again a disproportionately high number of Caucasian people, with there being 193 of them. This is over 50% of the entire cohort. Besides this, there were 57 African-Americans, 65 Hispanic, 37 Asian, and 14 Mixed/Others (Zhu et al., 2022). Once again, the Asian population tested is among the ethnicities with the least people considered. There was still an improvement from the ASCVD calculator however, as that one didn't even separate Asian populations into their own category and instead just grouped them into an 'Other' category.

The QRISK3 calculator completed its goal of predicting the risk of cardiovascular disease in patients with SLE. This was proven by the QRISK3 calculator outperforming most other calculators in the area under the receiver operating characteristic curve (ROC) with it being at 0.60 in patients with SLE. The only other calculator that outperformed it was PREDICTS with an ROC of 0.65 (Zhu et al., 2022). The ROC is based off of the AUC, or area under the curve, so it follows the same practice where the higher the number, the greater the performance. So though lacking proportionate ethnicity figures in the trial's testing, it does still help diagnose people with cardiovascular diseases.

Framingham Risk Score

The Framingham Risk Score is part of a multi-generational study with the goal of learning more about the heart. This specific calculator is used for cardiovascular purposes but is aimed more at hard coronary heart disease. When being used, the factors it takes in are age, sex, whether someone is a smoker, their total cholesterol, HDL cholesterol, systolic blood pressure, and whether their blood pressure is being treated with medicine or not (Wilson, 2023). The original cohort used for this was from the Framingham Heart Study, which had 4 different

cohorts. The original cohort had 5209 participants with 55% being female. The second generation cohort had 5124 participants with 52% being female. As time progressed, the study began to expand by acknowledging genetic and environmental risk factors, as well as the changing race and ethnic distribution of community members in the country, and started the Omni 1 cohort with 507 participants where 40% were Hispanic, 36% were black, and 23% were Asian. There was also the Omni 2 cohort with 410 participants where 41% were Hispanic, 25% were Asian, and 20% were African American (US Department of Health and Human Services). This cohort data was taken from the official Framingham Heart Study, so it can't be sure what was specifically used for the Framingham Risk Score portion of the study. So though the Asian population had the least participants in the study at first, the slight rise shows promise for the risk calculator.

Discussion

From all of the various cardiovascular risk assessments discussed in the paper, there is no clear outlier that completed the goal of working effectively for the Asian American population. To start off, the ASCVD Risk Calculator had been previously mentioned in this article for its lack of diversity in its clinical trials, showing its ability to be ineffective for a large population of people. This calculator is one of the most commonly used ones in primary care, though it may not be the best option because of its lack of diversity. So many people could be underestimated in risk, leading to there being a lack of treatment. This is very important as the delay in diagnosis may lead to a missed opportunity to treat cardiovascular diseases in a more mild stage.

AECRS1.0 and AECRS2.0 were the next risk calculators that were analyzed. These two calculators showed accuracy and could be used effectively, but only in the country of origin. In AECRS1.0 there was a cohort of only Japanese participants. As this calculator was tested and made in Japan, this makes sense as they would be the target population for it. For the sake of this paper, however, the risk calculator would only benefit that one ethnicity, and is not guaranteed to help diverse Asian populations, or at the least South Asians and West Asians as well. AECRS2.0 was very similar to this as the cohort was fully South Asian Indians. Again, the calculator was tested and made in India, so the trial population being entirely Indian makes sense. Though seemingly accurate, there is no saying whether the results would be the same with other Asian people, so it can't be fully right. In addition, with both of these calculators being developed in foreign countries, the environmental factors of living in the U.S. can't have been taken into account and results may not be generalizable to Americans. This includes factors like differences in diet, culture, and general living conditions. So though it would be helpful to the people in their origin countries, the Asian American population wouldn't gain as much help. Both of these calculators have great potential, and if re-tested again with a much more diverse pool of people, there is a high chance that it could be the next risk calculator used in primary care.

The QRISK3 calculator was a good calculator for the goal that it wanted, which was to include more risk factors to cater to a broader amount of cardiovascular diseases. While it does do that effectively, the Asian population in the cohort is one of the smallest groups. Despite this, there is still an improvement from other calculators because it is more diverse with the diseases taken into account, as well as the distribution of ethnicities. If tested once again with better equality of ethnicities, as well as sex with only 3% of the original cohort being male, the true accuracy of the calculator could be predicted, and more people could be helped. This version of QRISK also is not being used in primary care offices as of now. As a result, its accuracy in a greater population size like that isn't known, but it could very much be used in one in the future.

Lastly, the Framingham risk calculator seems to have promise with its accuracy for Asian Americans. Though there is no evidence to back it up in terms of primary care usage, the Framingham Heart Study is an ongoing study starting in 1948 that continually collects data on the topic (US Department of Health and Human Services). In the cohorts available for the study, the Asian population was still low compared to others but increased somewhat as time went on. As of now, there could still be a bit more improvement, but eventually, it can be very suitable for Asian American usage.

The information gathered from this paper is most helpful for Asian Americans as it directly addresses the healthcare challenges they face daily, especially in cardiology. By reading what is presented here, they would learn more about the possible inaccuracy of diagnosis with cardiovascular diseases. This increased awareness would help them ensure they get the best diagnosis and treatment so early action can decrease mortality rates for cardiovascular diseases.

By learning more about cultural competence, cardiologists and healthcare professionals would understand the need to change their action plan when meeting patients and diagnosing them to be more suited for the individual. This is in contrast to having the same diagnosis and attitude towards every patient. The awareness of the disparities in races in the clinical trials of the cardiovascular risk assessments would also help them realize that more tests might be necessary for a patient before immediately dismissing the possibility of heart disease. This thought process can be applied to public health officials as well because they would gain the information needed to help diverse communities.

The medical researchers who make cardiovascular risk calculators can understand the lack of representation of Asian Americans in their clinical trials for new risk assessments and make a change. As of now, they may not be aware of the inequality, but once they learn of it, they can improve their research methods. Health insurance companies and pharmaceutical companies also stand to gain from this study. New insurance plans could be made and more medicine could be issued if more Asian Americans realized the possible risk they have for cardiovascular diseases and got tested or diagnosed. This applies to policymakers as well once they understand the role cultural competence plays in healthcare. They would now understand what changes they may need to make to their previously existing policies, and what they can improve in the future.

Starting to teach this information at educational institutions before even fully getting into the medical field is essential for the future of healthcare. If students are taught about cultural competence and how they need to treat their patients differently based on their backgrounds, then they’re building the right skills to use in the future. The paper would help them address the needs of the Asian American community and also encourage them to do research on other ethnic groups, as the lack of representation is seen in many other communities as well.

Lastly, the insights garnered from this research paper hold significance for patient advocacy groups, especially those that fight for the health rights and needs of the Asian American population. The knowledge that they gain from this paper would help them understand where exactly representation is lacking, which would help them fight for reform in the system. It can also help them with targeted campaign awareness for Asian Americans as they have the exact information they need to help other Asian Americans realize the disadvantages they may be facing in the healthcare industry.

Conclusion

In conclusion, no one cardiovascular risk calculator stood out from the rest in a way that would make it the obvious choice for primary care use. After analyzing data from each calculator's clinical trials, almost none had a high proportion of Asian people. The couple of risk assessments that did manage to include the Asian population were very inclusive of one group of Asians instead of accounting for the whole race. As I was going through different papers to find ones that would suit the research I was doing here, I noticed how few results there were for Asian Cardiovascular Risk Calculators. Though there was still enough for me to conduct my research, there was very little compared to a search for cardiovascular risk calculators in general that would yield me more than ten times the amount of results. I also learned how much still needs to be improved in cardiology from a cultural competency lens. Though this study was aimed towards finding a risk calculator beneficial for Asian Americans, there needs to be more diversity of races and ethnicities in general in the clinical trials done to test the product. If this is done in future studies, many more people could be helped. In the future, I can only hope that more research goes toward improving cultural competence in cardiology for Asian Americans.

References

Becoming a Culturally Competent Health Care Organization: AHA. American Hospital Association. (2013). https://www.aha.org/ahahret-guides/2013-06-18-becoming-culturally-competent-health-care-organization#:~:text=Cultural%20competency%20in%20health%20care,social%2C%20cultural%20and%20linguistic%20needs

Centers for Disease Control and Prevention. (2023, May 15). *Heart disease facts*. Centers for Disease Control and Prevention. https://www.cdc.gov/heartdisease/facts.htm#:~:text=Heart%20disease%20is%20the%20leading,groups%20in%20the%20United%20States.&text=One%20person%20dies%20every%2033,United%20States%20from%20cardiovascular%20disease.&text=About%20695%2C000%20people%20in%20the,1%20in%20every%205%20deaths

Goff, D.C., Lloyd-Jones, D.M., Bennett, G., Coady, S., D'Agostino, R.B., Gibbons, R., Greenland, P., Lackland, D.T., Levy, D., O'Donnell, C.J., Robinson, J.G., Schwartz, J.S., Shero, S.T., Smith, S.C., Sorlie, P., Stone, N.J., Wilson, P.W.F. 2013 *ACC/AHA Guideline on the Assessment of Cardiovascular Risk: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines*. 2014 Jul, 63 (25_Part_B) 2935–2959. https://doi.org/10.1016/j.jacc.2013.11.005

Jamthikar, A. D., Gupta, D., Johri, A. M., Mantella, L. E., Saba, L., Kolluri, R., Sharma, A. M., Viswanathan, V., Nicolaides, A., & Suri, J. S. (2020). *Low-Cost Office-Based Cardiovascular Risk Stratification Using Machine Learning and Focused Carotid Ultrasound in an Asian-Indian Cohort.* Journal of medical systems, 44(12), 208. https://doi.org/10.1007/s10916-020-01675-7

Khanna, N.N., Jamthikar, A.D., Gupta, D., Nicolaides, A., Araki, T., Saba, L., Cuadrado-Godia, E., Sharma, A., Omerzu, T., Suri, H.S., Gupta, A., Mavrogeni, S., Turk, M., Laird, J.R., Protegerou, A., Sfikakis, P.P., Kitas, G.D., Viswanathan, V., & Suri, J.S. (2019, January). *Performance evaluation of 10-year ultrasound image-based stroke/cardiovascular (CV) risk calculator by comparing against ten conventional CV risk calculators: A diabetic study*, Computers in Biology and Medicine, Volume 105, 2019, Pages 125-143, ISSN 0010-4825, https://doi.org/10.1016/j.compbiomed.2019.01.002.

Krishnan, S. (2019, May 17). *South Asians and Cardiovascular Disease: The Hidden Threat*. American College of Cardiology. https://www.acc.org/Latest-in-Cardiology/Articles/2019/05/07/12/42/Cover-Story-South-Asians-and-Cardiovascular-Disease-The-Hidden-Threat

Ramsey, S. (2021, February 2). *CVD Risk Calculation: Can Smaller Clinics Break Through?*. KPWHRI. https://www.kpwashingtonresearch.org/news-and-events/recent-news/news-2021/cvd-risk-calculation-can-smaller-clinics-break-through

U.S. Department of Health and Human Services. (n.d.). *BIOLINCC: Framingham Heart Study (FHS)*. National Heart Lung and Blood Institute. https://biolincc.nhlbi.nih.gov/studies/fhs/

U.S. Department of Health and Human Services. (n.d.). *Framingham Heart Study (FHS)*. National Heart Lung and Blood Institute. https://www.nhlbi.nih.gov/science/framingham-heart-study-fhs#:~:text=When%20it%20launched%20in%201948,that%20contribute%20to%20cardiovascular%20disease

Viswanathan, V., Jamthikar, A. D., Gupta, D., Puvvula, A., Khanna, N. N., Saba, L., Viskovic, K., Mavrogeni, S., Turk, M., Laird, J. R., Pareek, G., Miner, M., Ajuluchukwu, J., Sfikakis, P. P., Protogerou, A., Kitas, G. D., Nicolaides, A., Sharma, A., & Suri, J. S. (2020). *Integration of estimated glomerular filtration rate biomarker in image-based cardiovascular disease/stroke risk calculator: a south Asian-Indian diabetes cohort with moderate chronic kidney disease.* International angiology : A Journal of the International Union of Angiology, *39*(4), 290–306. https://doi.org/10.23736/S0392-9590.20.04338-2

Wilson, P. W. F. (2023). *Framingham risk score for hard coronary heart disease*. MDCalc. https://www.mdcalc.com/calc/38/framingham-risk-score-hard-coronary-heart-disease

World Health Organization. (2023). *Cardiovascular diseases*. World Health Organization. https://www.who.int/health-topics/cardiovascular-diseases#tab=tab_1

Zhu, L., Singh, M., Lele, S., Sahakian, L., Grossman, J., Hahn, B., & McMahon, M. (2022). Assessing the validity of QRISK3 in predicting cardiovascular events in systemic lupus erythematosus. *Lupus science & medicine*, *9*(1), e000564. https://doi.org/10.1136/lupus-2021-000564