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Clinical programs for cardiometabolic health for South Asian patients in the United States: A review of key program components

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Abstract

Medical literature shows that South Asians have approximately a 2-fold higher risk of atherosclerotic cardiovascular disease (CVD) compared with other populations. Given this high prevalence, clinical programs to promote cardiovascular health have emerged in the United States that are dedicated to clinical care for South Asian individuals. In this review, we have summarized the key characteristics of clinical programs in the U.S. dedicated to preventing and managing CVD in South Asian American patients. These clinical centers have many unique components in common that are catered to South Asian patient populations including ethnicity concordance of clinical providers, intensive cardiovascular screening protocols with laboratory studies and potentially genetic testing, dieticians and nutritionists who are familiar with South Asian-style dietary patterns, health coaches to support behavior change, community outreach programs, and involvement in clinical research to learn further about risk factors, prevention, and treatment of cardiovascular disease in South Asian populations. There are still many evidence and programmatic gaps left to uncover in the prevention, diagnosis, and management of CVD in South Asian. This review provides guidance for important features, barriers, and facilitators for future cardiovascular centers to develop in the United States where they can serve South Asian populations.

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Disclosures

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Keywords

South Asian; Cardiovascular disease; Clinical centers

Introduction

South Asians are among the fastest growing ethnic populations in the United States [1]. According to the U.S. Census, the South Asian population in the U.S. grew by more than 150 percent from 2000 to 2018, from 2.2 million to 5.4 million [2]. The population of South Asians in the United States includes individuals with origins from Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan, and Sri Lanka [3]. A growing body of medical literature illustrates two sobering themes for South Asians' cardiovascular health: 1) they have approximately a 2-fold higher risk of atherosclerotic cardiovascular disease (CVD) compared with other populations and 2) this disease manifests 10 years earlier, on average, compared to other ethnic groups [3–6]. South Asians in the U.S. have higher mortality rates from ischemic heart disease compared with other Asian subgroups and non-Hispanic White adults [6].

Available evidence indicates that the excess risk of CVD in South Asian individuals can likely be ascribed to a large burden of uncontrolled cardiovascular risk factors. For example, compared with non-Hispanic White (NHW) individuals, South Asian adults have a 2-fold higher risk of type 2 diabetes, higher rate of incident diabetes mellitus, and higher prevalence of impaired glucose tolerance compared to non-Hispanic White populations [7]. Similarly, South Asian adults in the U.S. are less physically active than non-Hispanic White adults [8,9]. In the U.S., hypertension is a very common CVD risk factor in South Asians, with a prevalence of 43 percent in men and 35 percent in women in the Mediators of Atherosclerosis in South Asians Living in America (MASALA) study, a cohort of predominantly immigrant South Asian American adults [10–12]. In addition, suboptimal diet quality, with particularly high consumption of carbohydrates and saturated fats in the South Asian dietary pattern, contributes to cardiovascular risk [13]. The length of time that South Asians live in the U.S. may also influence their health behaviors as they integrate their culture to the host culture [14]. The MASALA study noted that as South Asians live in the U.S. for longer periods of time, they tend to have higher consumption of fat, alcohol, and red meat [15]. These metabolic and lifestyle factors, plus additional cardiovascular risk factors such as obesity and hypertension, contribute towards South Asians' disproportionately higher risk of CVD [16]. Beyond traditional cardiovascular risk factors, the contribution of social determinants (such as acculturation) and genetic factors towards cardiovascular risk among South Asian individuals are active areas of study [3].

Given the high prevalence of cardiovascular disease (CVD) and its associated risk factors in the South Asian population in the U.S. and the diaspora, coupled with unique cardiovascular risk factor profiles and culturally influenced health behaviors, clinical programs to promote cardiovascular health and prevent and manage cardiovascular disease have emerged that are dedicated to clinical care for South Asian individuals in the U.S. This summary provides a review and pathway to develop clinical programs focused on South Asian cardiometabolic

health. In this review, we summarize the key characteristics of several clinical programs in the U.S. that are dedicated to preventing and treating CVD in South Asian American patients. The objectives of this review are 1) to identify the clinical program structural factors, program services offered, cultural adaptations, and additional unique features of these clinics that support their success, and 2) to provide a guide to develop a cardiovascular and cardiometabolic health program for South Asian patients.

Demographics of South Asian individuals in the U.S

The South Asian community in the U.S. is particularly concentrated in certain areas of the country, with the largest numbers found in California, New York, New Jersey, Texas, and Illinois (Fig. 1) [3]. More recent data shows that the metropolitan areas with the largest populations of South Asians are New York City, Chicago, San Francisco, Dallas, Washington D.C., San Jose, and Los Angeles [1].

Most (80%) of the South Asian population in the U.S. are Asian Indian in origin, followed by Pakistani, Bangladeshi, Nepalese, Sri Lankan, and Bhutanese [3]. In 2019, the average age of Indians living in the U.S. was 33 years old, which was younger than Asians in aggregate (average age: 34) and the U.S. as a whole (average age: 38) [1]. In addition, 43 percent of the Indian American population had a postgraduate degree, 32 percent had a Bachelor's degree, 10 percent attended some college, and 15 percent attended high school or less. This represents a higher level of education compared to Asian individuals amongst whom 24 percent had a postgraduate degree, 30 percent had a Bachelor's degree, 19 percent attended some college, and 27 percent attended high school or less. In 2019, the median annual household income of all Indians in the U.S. was \$119,000, which is higher than the median annual household income of Asians in aggregate in the U.S. at \$85,800. This data indicates that in 2019, Indian Americans were younger, more educated, and financially wealthier compared to Asians as a whole in the U.S.

Clinical programs for South Asian health

As of 2022, prominent clinical centers adapted specifically for South Asian populations are located in California, Illinois, Ohio, New York, and Georgia (Table 1, Fig. 1). This review focuses on established clinical programs that are publicly advertised as of 2022, including (1) the Stanford South Asian Translational Heart Initiative (SSATHI, Stanford, California), (2) the South Asian Cardiovascular Center by Advocate Health Care (Park Ridge, Illinois), (3) the South Asian Heart Center (SAHC) by El Camino Hospital (three locations in Northern California in the San Francisco Bay Area), (4) Prevention and Awareness for South Asians at Palo Alto (PRANA, Palo Alto, California), (5) the South Asian Cardiovascular Clinic (SACC, Cincinnati, Ohio), (6) the South Asian Health Initiative (SAHI, New York City, New York), and (7) NSC Cardiology (two locations in Georgia in the Atlanta metropolitan area). Information about each of these programs was abstracted from program websites. The leadership of each of these centers includes physicians of South Asian origin. Clinic staffing includes 1–8 physicians, plus additional clinical and administrative staff that includes nurses, coordinators, health coaches, nutritionists, and dietitians. Further details about each clinical center's services are provided in Table 1. There

are additional centers that have been recently established for South Asian patient populations and are continuing to grow in areas including Georgia, Illinois, Maryland, Minnesota, New Jersey, Ohio, Texas, and Canada. While information about these centers was less available, these programs are listed in Table 2. A case study of the SSATHI clinic with additional details is listed in Table 3.

Structure of clinical encounters

The structure of clinical encounters at each center varies, although many of the programs follow a traditional outpatient clinical model. At SSATHI in Stanford, California, the South Asian Cardiovascular Center in Park Ridge, Illinois, PRANA in Palo Alto, California, SACC in Cincinnati, Ohio, and NSC Cardiology in Northern Georgia, patients have an initial appointment with a cardiologist for a comprehensive evaluation of their health including medical history, review of laboratory studies, assessment of lifestyle and health behaviors, to evaluate each patient's cardiovascular risk. The initial consultation is followed by subsequent appointments with cardiologists, dietitians, health coaches, and genetic counselors as indicated, to review further results and monitor progress for behavior modification recommendations.

Various forms of laboratory testing and imaging are performed at these centers to inform prevention, diagnosis, and management cardiovascular disease in their South Asian patient populations. For example, at the South Asian Cardiovascular Health Initiative (SACHI) in the Ciccarone Center at Greater Baltimore Medical Center, lab testing is determined based on the patient's medical history and family history. For patients who have a family history of coronary heart disease, patients typically have lipoprotein(a) levels assessed. For patients with dyslipidemia, the levels of apolipoproteins ApoB100 and ApoA1 are often obtained to help assess patients' risk for atherosclerotic disease. Obtaining a coronary artery calcium (CAC) score is determined based on a patient's risk factors, and often used to help refine and reclassify a patient's assessed risk. Given the burden of atherosclerotic CVD at younger age among South Asians, CAC scores are considered at younger ages. For instance, obtaining a CAC score is considered among patients aged 30–40 years with two or more CVD risk factors. Also, CAC scores are often obtained among patients older than age 40 years if their estimated risk of an atherosclerotic disease event in the next 10 years is between 5 and 20 percent (i.e., borderline to intermediate risk).

The SAHC program in Northern California has developed a system called "AIM to prevent," which is designed to specifically address heart disease and diabetes in South Asians. This is a fee-based program that provides a personalized and comprehensive report encompassing the patient's risk for CVD, culturally tailored lifestyle counseling, and an annual clinical follow-up. Patients are assigned to a health coach, who works with each patient regularly to encourage and facilitate behavior change and assess adherence over time, thus following a more individualized training program structure. The SAHI program in New York City collaborates with various community- and faith-based organizations in the area to organize health fairs at which they provide services including free screenings for hypertension, diabetes, and high cholesterol, assistance with health insurance enrollment, and information about free or low-cost healthcare services.

Cardiovascular health behavior change programming

Two common features of these South Asian clinical programs are patient education and lifestyle change implementation. A key benefit of a cardiovascular health clinic that focuses on South Asian populations is the ability to more closely support health behavior change, focusing on recommendations that account for cultural factors that play a role in health, such as dietary pattern and quality.

Some research has shown that two prominent dietary patterns are common among the South Asian population living in the U.S.: a Western-style diet, and a vegetarian diet [15]. Both of these patterns may be associated with clinical metabolic risk factors like diabetes or obesity. Since these clinics are developed and run by staff who have familiarity with typical South Asian lifestyles and diets, they can culturally adapt health behavior recommendations to the context of their specific patient population. One unique example of this is the South Asian Cardiovascular Center in Park Ridge, Illinois which has created and disseminated a health education video series called “Dil Se” (“From the Heart” in Hindi) which consists of YouTube videos produced and narrated by South Asian individuals. These videos provide adapted health behavior education, such as sharing facts and debunking myths related to heart health that are common in South Asian communities, and providing recommendations about improving the quality of South Asian-style diets [17]. For example, the recipes provided in these videos consist of typical South Asian foods with certain modifications to make them healthier, such as serving *channa masala* (a garbanzo bean curry) as a lettuce wrap, in-stead of with flatbreads. In addition, there are educational videos that teach individuals about the potential benefits and harms of specific food components, such as carbohydrates and fats.

Many of these clinics, such as the SAHC program in Northern California and SACC program in Cincinnati, Ohio, provide personalized management plans to their patients that include suggestions for changes to make within a South Asian-style diet. NSC Cardiology in Northern Georgia provides educational pamphlets to their patients that explain the impact of various diets on cardiovascular health, including studies that recommend reducing salt and sugar intake, and studies that share benefits of the Mediterranean diet so that South Asian patients can adapt Mediterranean-style dietary patterns to the typical South Asian diet.

While some clinics use multimedia to educate their patients about South Asian diets, other clinics such as PRANA in Palo Alto, California include nutritionists amongst their staff who have extensive experience with common risk factors in South Asian individuals and can apply their experiences directly to the patients. Similarly, SSATHI provides nutritional guidance to their patients from a dietitian with expertise in optimizing the healthfulness of South Asian cuisine. Almost all of the programs prioritize a focus on learning more about their patients’ mixed South Asian and Western diets, and providing resources to help make changes towards a healthier diet.

In addition to making dietary pattern changes, South Asian cardiovascular clinics emphasize physical activity and exercise as a modality to reduce CVD burden. The SSATHI clinic and El Camino programs both include health coaches who undergo specific training to

recommend lifestyle changes to patients which includes an emphasis on physical activity. The SAHC program includes evidence-based information for the different ways by which one's lifestyle can affect health and quality of life, including sleep, stress, obesity, diet, and exercise. These are the factors that the health coaches focus on optimizing for their patients. In addition, the SACC program includes an exercise physiologist on their staff to help analyze their patients' physical fitness and implement changes for optimization.

Community outreach

Community outreach is another strategy employed by many of these clinics to develop stronger connections with South Asian individuals within their local community and provide cardiovascular healthcare and education. Three of the seven clinics specifically highlight their active participation in community outreach. The South Asian Cardiovascular Center (SACC) reaches out to South Asian establishments in the Northeastern Illinois area including faith-based organizations, restaurants, and retail and grocery stores to provide education and free screenings to community members. PRANA provides health education classes on topics including high cholesterol, hypertension, and diabetes along with free community lectures at various health system locations. The SAHI program organizes health fairs with local religious and community organizations such as the South Asian Council of Social Services to offer free screenings for hypertension, diabetes, high cholesterol, and information about free or low-cost healthcare services.

Another format by which these clinics share information with their South Asian communities is by providing education about cardiovascular disease directly on their websites. Six of the seven clinics share resources on their websites sharing information on a variety of topics including the causes, risk factors, symptoms of CVD, and recommendations for preventing CVD. Many clinics, such as the SSATHI program, provide a link to infographics and frequently asked questions and answers that are focused on managing heart disease in South Asians. SACC contains links to YouTube™ videos of South Asian patients recounting their experiences with heart disease and how they overcame the challenges associated with heart disease management. The PRANA program website provides articles on various topics related to CVD subtopics including nutrition, physical activity, women's health, and teen health. Through this sharing of resources, these clinics provide education to help expand their reach to South Asian individuals beyond their clinic's patient population.

Clinical research

In addition to clinical practice, three out of the seven clinics actively participate in clinical research germane to the pathophysiology and/or treatment of cardiovascular disease in South Asians. For example, the SSATHI program in Stanford, California reports substantial involvement in research, and the program's website provides a list of clinical trials open for enrollment. Some of the research projects undertaken by these clinics pertain directly to investigating trends of health and disease within South Asian populations. For example, in 2022, the SAHI program in partnership with the New York University Institute of Environmental Medicine, recruited participants into a study assessing the awareness of health risks posed by exposure to arsenic in drinking water among Bangladeshi immigrants

in New York City, with the purpose to develop culturally and linguistically appropriate health education materials for Bangladeshi individuals and their healthcare providers. The NSC Cardiology program lists various projects studying access to care, acute coronary syndromes, and health outcomes in South Asians, and provides patients with information about the risks and benefits of enrolling in clinical trials.

Access to care

South Asian cardiovascular clinics also play a role in supporting their patients' overall health by facilitating their access to care. The SAHI program aids its patients with the enrollment process for health insurance. Given the language and cultural barriers that South Asian immigrants may face, facilitating health insurance enrollment may help patients of this clinic more readily access health care services. This program also provides information about free or low-cost healthcare services that are available for their patients.

Telehealth is a virtual form of communication between clinicians and patients that found an uptake in its use during the COVID-19 pandemic. Two out of the seven of the highlighted clinics devoted to South Asian populations advertise a telehealth option for patients: the SSATHI program in Stanford, California and the PRANA clinic in Palo Alto. In 2017, SSATHI in Stanford, California introduced CardioClick, a clinical pathway that replaced in-person follow-up visits with video visits. CardioClick patients more frequently completed the clinic's CVD prevention program in less time than those who had traditional in-person follow-up. The experience of the CardioClick program in SSATHI suggests that telehealth may facilitate cardiovascular prevention programs and health coaching for South Asian patients.

Future directions and conclusions

This review highlights the key features of several U.S. based programs that focus on South Asian cardiovascular and metabolic health (Fig. 2). These programs have many components in common that are catered to South Asian individuals including ethnicity concordance of clinical providers, intensive cardiovascular screening protocols with laboratory studies and potentially genetic testing, dietitians and nutritionists who are familiar with South Asian-style dietary patterns, health coaches to support behavior change, medicine subspecialists, community outreach programs, and involvement in South Asian centric clinical research. As the South Asian population in the U.S. is rapidly expanding, these programs are leading effort to adapt evidence-based recommendations to South Asian patients. There are still many evidence and programmatic gaps left to uncover in the prevention, diagnosis, and management of CVD in South Asian patients including the development of culturally specific and language accessible health education materials for South Asian subgroups (Table 4). Additionally, these clinical programs' linkage with community organizations and stakeholders (such as religious institutions, e.g., temples, mosques, and churches) varies, though strengthening community partnerships is likely to help widen the reach of these programs to promote health among the South Asian population. This review provides guidance for important components, barriers, and facilitators for future cardiovascular centers to develop in the United States where they can serve South Asian populations.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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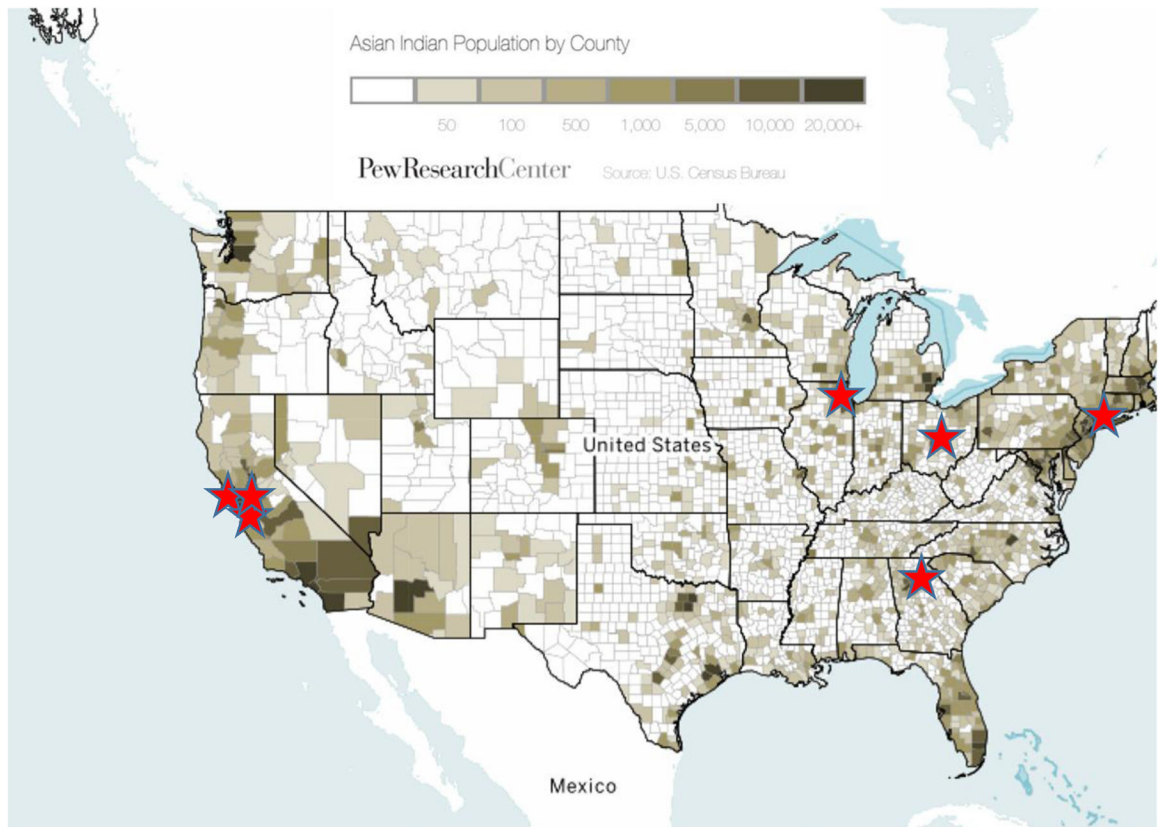


Fig. 1. Asian Indian Population by County from 2010 U.S. Census Bureau³
Stars indicate the locations of the seven cardiovascular clinics highlighted in this review, located in Palo Alto, CA; Mountain View, CA; Park Ridge, IL; Cincinnati, OH; New York City, NY; and Johns Creek, GA. Map adapted from Volgman AS, et al. *Circulation*. 2018.

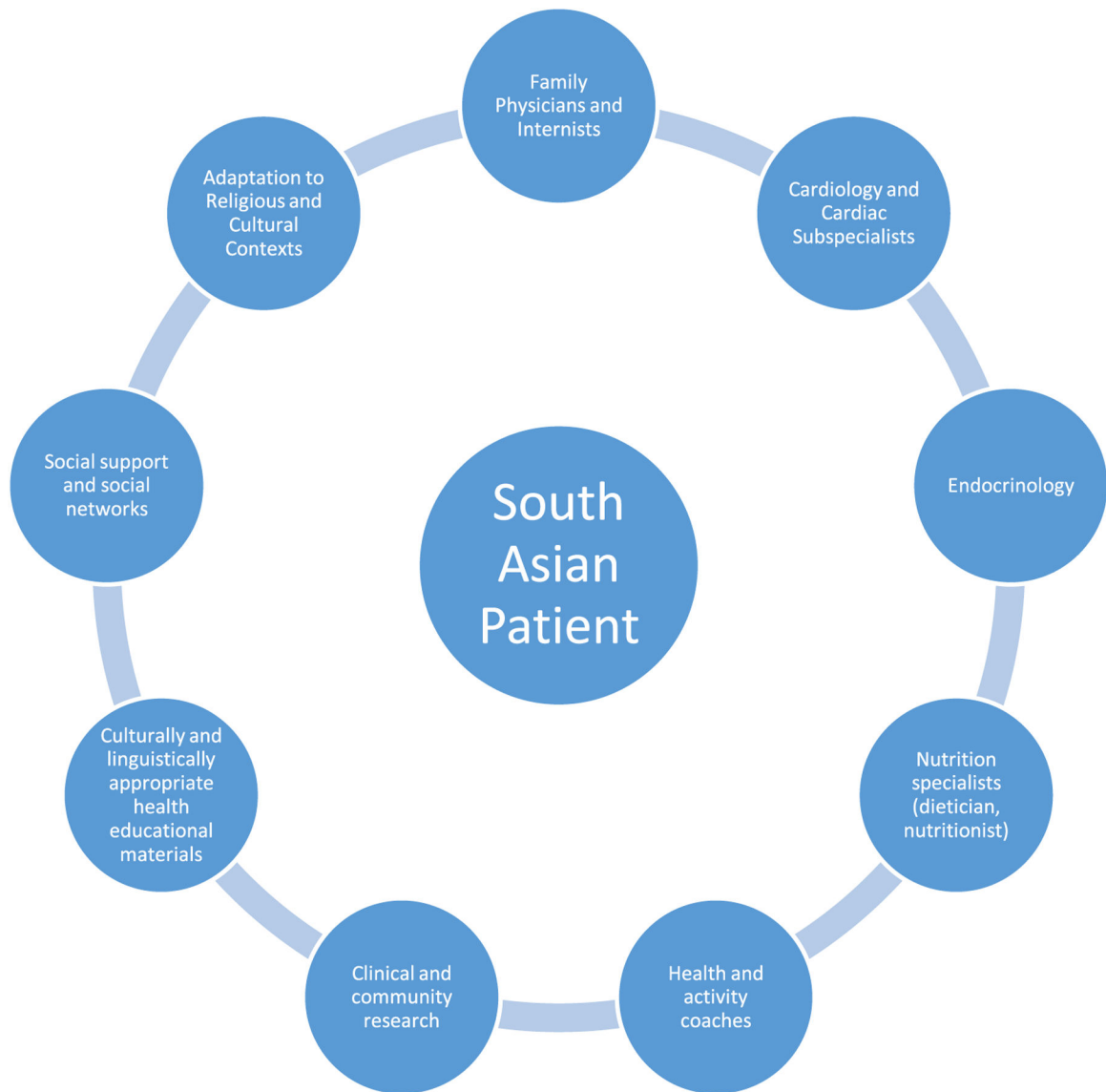


Fig. 2.

Key Elements Needed to Create a South Asian Cardiometabolic Program

This figure illustrates the various components and team members needed to create a South Asian cardiometabolic program including cardiology and endocrinology subspecialists, nutrition specialists, health coaches, researchers, social support, and adaptation to religious and cultural contexts.

Table 1

Directory of South Asian cardiovascular centers highlighted in this review.

Clinic name	Locations	Website
Stanford South Asian Translational Heart Initiative	<ol style="list-style-type: none"> 1 Boswell Building: 300 Pasteur Drive, 2nd floor, Room A260, Stanford, CA 94305 2 Portola Valley: 3260 Alpine Road, Portola Valley, CA 94028 3 Santa Clara: 2518 Mission College Boulevard, Santa Clara, CA 95054 	https://stanfordhealthcare.org/medical-clinics/stanford-south-asian-translational-heart-initiative.html
South Asian Cardiovascular Center at Advocate Lutheran General Hospital	1875 Dempster St, Suites 525 & 555 Park Ridge, IL 60068	https://www.advocatehealth.com/health-services/advocate-heart-institute/programs-and-treatments/preventive-care/south-asian-cardiovascular-center/
South Asian Heart Center at El Camino Hospital	Multiple locations, Bay Area, CA	https://southasianheartcenter.org/
Prevention and Awareness for South Asians at Palo Alto	Multiple locations, Bay Area, CA	https://www.sutterhealth.org/health/south-asian
South Asian Comprehensive Cardiovascular Clinic	<ol style="list-style-type: none"> 1 The Christ Hospital Outpatient Center – 11,140 Montgomery Road, Cincinnati, OH 45249 2 The Christ Hospital Outpatient Center – 7545 Beechmont Ave., Cincinnati, OH 45255 	https://www.thechristhospital.com/services/heart/specialized-care-and-treatment/-south-asian-cardiovascular-clinic
South Asian Health Initiative	New York City metropolitan area	https://www.mskcc.org/departments/psychiatry-behavioral-sciences/fimmigrant-health/working-diverse-communities/south-asian-health-initiative
NSC Cardiology	<ol style="list-style-type: none"> 1 5400 Laurel Springs Parkway, Suite 1401, Johns Creek, GA 30024 2 1100 Northside Forsyth Drive, Suite 345, Cumming, GA 30041 	https://heartdrsingh.com/contact/johns-creek/

Table 2

Additional South Asian cardiovascular centers [18].

Program Name	Location
Emory – Atlanta South Asian Health Alliance (ASHA)	Atlanta, Georgia
South Asian Cardiovascular Health Initiative (SACH) for the Ciccarone Center at Greater Baltimore Medical Center and Greenspring Station	Towson, Maryland
SEWA-AIFW (Asian Indian Family Wellness)	Minneapolis, Minnesota
Rutgers – Robert Wood Johnson Medical School, South Asian Total Health Initiative (SATHI)	New Brunswick, New Jersey
The Christ Hospital Outpatient Center – Montgomery, South Asian Comprehensive Cardiovascular Clinic	Cincinnati, Ohio
Cardiovascular Health in Asian Indians (CHAI)	Cleveland, Ohio
Baylor Scott & White Heart Hospital Baylor Plano	Plano, Texas
Baylor College of Medicine Cardiometabolic Initiative	Houston, Texas
South Asian Risk Assessment Clinic	Ontario, Canada – Brampton, Toronto
Fraser Health – South Asian Health Institute	British Columbia – multiple locations

Table information adapted from: <https://www.acc.org/latest-in-cardiology/articles/2021/08/02/14/16/south-asian-cardiovascular-health>.

Table 3**A Case Study of the SSATHI Cardiometabolic Clinic in Stanford, California.**

Clinic location	Stanford University Medical Center: <ul style="list-style-type: none"> • Boswell Building, 300 Pasteur Drive, Stanford, CA 94,305 • 3260 Alpine Road, Portola Valley, CA 94,028 • 2518 Mission College Boulevard, Santa Clara, CA 95,054
Target population	South Asian adults in the San Francisco Bay Area <ul style="list-style-type: none"> • Originally focused on individuals <60 years old • Current participation includes 1st generation, 2nd generation, and 3rd generation immigrants from South Asia
Structure of clinical visit	<ul style="list-style-type: none"> • First visit with cardiologist to review medical history, labs, imaging • Follow-up visits with cardiologist, dietician, health coach, diabetic instructor, and laboratory studies as appropriate
Telehealth services provided	CardioClick: Telemedicine clinic program that allows virtual visits with cardiologists and other staff
Non-routine laboratory testing offered	<ul style="list-style-type: none"> • Advanced lipid profiles • Lp(a) • Homocysteine • 2-hour glucose tolerance tests
Website	https://stanfordhealthcare.org/medical-clinics/stanford-south-asian-translational-heart-initiative.html
Facilitators of developing and implementing the clinical program	<ul style="list-style-type: none"> • Health system leadership able to allocate funding and resources • Organized and comprehensive financial plan, with support from health system clinical leadership • Pool of interested and adherent patients locally • Dedicated faculty and staff including cardiologists, nurses, health coaches, dieticians who are knowledgeable about South Asian style diets, nutritionists, and exercise physiologists • Program coordinator to coordinate daily functions of the clinic • Strategy of enabling patients to use technology such as CardioClick to increase engagement • Dietician who is expert of South Asian style diets • Strategy to spread awareness about the clinic to the community • Telehealth option to increase engagement with patients
Barriers to developing and implementing the clinical program	<ul style="list-style-type: none"> • Financial obstacles: <ul style="list-style-type: none"> – Developing a robust business plan

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- Determining how and if laboratory tests that were not routine (e.g. genetic testing or advanced lipids) would be reimbursed
 - Obtaining funding for research programs
 - Understanding how the payer mix of eligible patients (e.g., private insurance or otherwise) would influence the financial viability of such a program
 - Adherence of patients to the program, especially if intensive clinical management is indicated
 - Hiring enough clinical staff for all of the responsibilities and day-to-day tasks of the clinic. For example, an extra nurse was needed to conduct a 2-hour glucose tolerance test on every patient.
 - Securing an accessible, appropriately-sized location for the clinic
-

Table 4**Future Directions and Evidence and Programmatic Gaps for Cardiovascular Care Programs for South Asian Patients.**

Development and dissemination of culturally specific and language accessible health education materials for South Asian subgroups (Indian, Pakistani, Bangladeshi, etc.)
Optimal implementation of preventive genomics for South Asian patients
Development of effective family and social network based interventions for cardiovascular health behavior change
Participation in clinical trials to evaluate pharmaceutical agents' effectiveness and side effects in South Asian patients
Further research about cardiometabolic risks of South Asian style diets
Further research on exercise and physical fitness in South Asians
Family-based cardiovascular prevention across multiple generations
Collaboration with primary care physicians to address the unique health risks of South Asian patients for CVD prevention and management earlier, and refer to local programs for intensive prevention efforts
Dedicated training for clinicians, dietitians, nutritionists, nurses for culturally-specific dietary recommendations
Development of a strategy to grow outreach to South Asian communities

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