

A study of primary and secondary prevention of cardiovascular disease in the People's Republic of China

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Abstract :

A study was conducted at 27 centers in 12 twelve communities in China to determine the feasibility of conducting a National Healthy Heart Program for China focused on primary and secondary prevention for cardiovascular diseases. Interviews were conducted with over 150 professionals and patients to determine existing needs related to professional and patient education and assess the need for a well designed multifaceted comprehensive education program related to primary and secondary prevention of cardiovascular disease. Demographic data clearly indicates the rise in the incidence of cardiovascular disease and as invasive intervention is cost prohibitive for many citizens, the emphasis should be on primary and secondary prevention so that the rising trend may be slowed or reversed.

Key words : international health, cardiovascular disease prevention, health education programs

Introduction

China, as it experiences greater economic development, confronts a significant increase in cardiovascular disease. The improved economic status has facilitated the eradication of infectious diseases. However, with nutritional changes comes exacerbation of problems related to hypertension such as hemorrhagic stroke and hypertensive heart disease. The incidence of Rheumatic Heart disease and related nutritional deficiency disorders of the heart muscle diminishing⁽¹⁾. Cardiovascular disease, largely heart attack and stroke, is the leading cause of death in the world today and is expected to remain so by the year 2020⁽²⁻⁸⁾. *The World Health Organization Multinational Monitoring of Trends and Determinants in Cardiovascular Disease* (WHO MONICA) Project suggests a reason for possible optimism: heart attack rates are declining in most MONICA centers and there is no reason why these improvements cannot be maintained and extended to other countries. However, developing countries are experiencing a significant increase in cardiovascular disease⁽⁹⁻¹⁰⁾. WHO has given priority to the prevention and control of cardiovascular diseases,

and non-communicable diseases in general as an indication of its desire to accelerate these favorable trends in all countries and to apply what has been learned from MONICA to countries currently experiencing an increase in cardiovascular disease⁽¹¹⁾.

The Institute of Medicine Report on the Control of Cardiovascular Diseases in Developing Countries⁽¹²⁾ states that over 52 million deaths reported worldwide in 1990, 15 million were attributable to cardiovascular disease⁽¹³⁾. In 1997, of the 52.2 million deaths, 15.3 million were due to circulatory diseases indicating that the number of deaths attributable to cardiovascular disease continues to increase⁽¹⁴⁾. The magnitude of the burden of cardiovascular disease in developing coun-

1996 GLOBAL CVD DEATHS 15.3 million (30% of all deaths)	
Developed Countries 5.52 million (45.6% of all deaths)	Developing countries 9.77 million (24.5% of all deaths)
76% excess CVD deaths in developing countries	

Figure 1 : Distribution of Cardiovascular Deaths for 1996⁽¹⁴⁾

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tries is reflected in the following figures. Figure 1 illustrates the distribution of the deaths from cardiovascular disease compared with "developed" and "developing" countries⁽¹⁴⁾.

At this time, China, while in an upward transition economically is still classified as a developing country. Developing countries account for nearly 2/3 of all cardiovascular deaths in the entire world that supports that cardiovascular deaths do

occur in developing countries in spite of the conventions/wisdom that has suggested that cardiovascular disease is only seen in industrialized countries.

The second figure identifies the three leading causes of cardiovascular mortality and the Daily Adjusted Life Years which clearly indicates that the greatest burden is in the developing countries where diagnosis and treatment is less available.

Contributions to Global CVD : 1990				
Region	CVD mortality	Coronary mortality	Stroke mortality	CVD DALYs
EME	22%	30.3%	17%	14.9%
EF (FSE)	15%	21.7%	14.3%	11.5%
DC	63%	58%	68.7%	73.6%

EME : Established Market Economies
 ET : Economies in Transition (Former Socialist Economies)
 DC : Developing Countries
 DALY : Disability Adjusted Life Year

Figure 2 : Cardiovascular Mortality and Daily Adjusted Life Years by Economic Development of Countries⁽²⁾

Developmental and geographic differences in the burden of cardiovascular disease are reflected in Figure 3. China experiences a significant burden

from cardiovascular disease in 1990 and the recent data collected indicates a significant rise in the past 10 years.

Regional Differences in Burden of Cardiovascular Disease (1990)					
Region	Population (millions)	CVD mortality (thousands)	Coronary mortality (thousands)	Cerebrovascular mortality (thousands)	DALYs lost (thousands)
Developed regions	1144.0	5328.0	2678.0	1447.9	39118
Developing regions	4123.4	9016.7	2469.6	3181.2	108802
Established market economies	797.8	3174.7	1561.6	782.0	22058
Former socialist economies	346.2	2153.3	1116.3	665.9	17060
India	849.5	2385.9	783.2	619.2	28592
China	1133.7	2566.2	441.8	1271.1	28369
Other Asia and Islands	682.5	1351.6	589.2	350.4	17267
Sub-Saharan Africa	510.3	933.9	109.9	389.1	12252
Middle East Crescent	503.1	992.3	276.6	327.4	12782
Latin America	444.3	786.7	269.1	224.1	9538

DALY : Disability Adjusted Life Year

Figure 3 : Regional Differences in Burden of Cardiovascular Disease (1990)⁽²⁾

In the developing countries death from cardiovascular disease occurs in 46.7% deaths of individuals under 70 years of age compared with the

established market economies in which premature death from cardiovascular disease occurs only about 22.8% of the time⁽¹⁵⁾.

The relative proportion of cardiovascular deaths and incidents of cardiovascular disease in developing countries is expected to increase during the next 20 years because of the demographic changes that are occurring; such as, the eradication of infectious diseases, and cumulative exposure to risk factors such as smoking, life style changes as a result of urbanization and industrialization, as well as improper nutrition⁽¹⁶⁾. For example, in urban China cardiovascular deaths as a proportion of all deaths rose from 12.1% in 1957 to 35.8% in 1990. The following diagram indicates the distribution of the various types of cardiovascular disease in China in 1994 Figure 4.

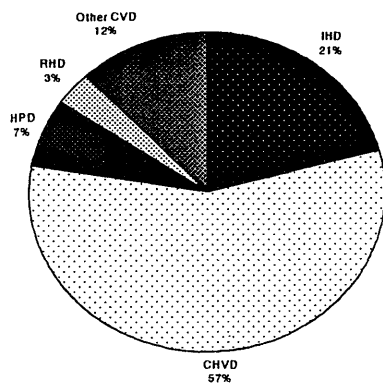


Figure4 : Diagram illustrating the Distribution for Types of Cardiovascular Disease 1994 in China⁽¹⁷⁾

Cardiovascular disease contributes to a third of the global mortality. With two-thirds of all CVD and three-fourths⁽¹⁵⁾ of the global disability adjusted life years, arising in developing countries, there is a mandate that action be taken to reduce loss of life and the cost to society. Cardiovascular disease is a problem that must be addressed in China as a major public health issue. The Ministry of Public Health has made reference in the WHO country report⁽¹⁸⁾. The MONICA project reveals the impact of secondary prevention for the extension of life. The increasing cost of invasive treatment for cardiovascular disease requires a country such as China, considering the magnitude of the problem and the limitations of financing health care with the focus must be on primary and secondary intervention⁽¹⁹⁾.

The Chinese Ministry of Health noting that heart disease ranks as the leading cause of death, has included this focus in its five-year plan. Hypertension is the most prevalent cardiovascular disease in China, with 50-60 million adults affected. Each year October 8 is designated as National Cardiovascular Awareness Day and community screening is mandated by hospitals at all levels.

Purpose

The purposes of the study of primary and secondary prevention of cardiovascular disease in the People's Republic of China were to assess and validate cardiac care needs and epidemiological indices at the tertiary, secondary, and primary care levels as well as confer with other health professionals currently providing cardiac health care services in an attempt to understand their needs and those of their patients. The study was to examine all relevant aspects of healthy heart issues in China to determine the feasibility of developing and then implementing strategies for an education program targeting public education and prevention through professional training with emphasis on primary and secondary prevention in six regional sites. Recommendation of a program was also part of the study.

Objectives of the study were:

1. To identify and analyze the principal causes of cardiovascular disease in China including dietary and other environmental factors
2. To verify and validate cardiac care needs and epidemiological indices at the tertiary, secondary, and primary care levels
3. To assess educational needs of physicians, nurses and other health professionals providing cardiac health care services
4. To establish the feasibility of institutional partnerships and outline responsibilities
5. To highlight culturally sensitive areas and to recommend ways of overcoming problems in such a way as to reach the largest possible target population

Methodology

The study included visits to 10 tertiary, 4 secondary and 7 primary hospitals along with 6 residential care facilities meeting with over 150 professionals in the six regions of China: Guangzhou, Shanghai, Beijing, Xian, Chengdu and Tibet during a two week period. The map in Figure 5 indicates the regions served by each contact. The country is divided into six major geographic areas and in each area there are universities assigned the responsibility for continuing medical education for the region.



Figure 5 : Six Regions of China

An assessment tool was used to gather data for the project. The data related to each site was recorded on a general assessment form completed at each facility during the visit. At each site interviews were conducted with key personnel in an effort to accrue data on the incidence of cardiovascular disease the organization of the facility including its resources for providing care, the level of patient teaching currently conducted, preparation of professional staff, continuing education needs, and plans for the future. Patient education and screening were consistently identified as a need and each site was asked to submit a copy of how they planned to address these issues.

Overall findings

The information acquired supports the need for a well designed program involving the education

of health care professionals (particularly designing educational programs for primary care professionals), patients and families for both primary and secondary prevention. The major causes of increased cardiovascular disease are: change in life styles, change in dietary patterns, reduction of exercise and longevity. Patient teaching is already being done by some of the centers, however the materials are limited. Mostly verbal teaching is accomplished although the staff consistently talks about the low reading level of their patients. The data supports the hypothesis that Cardiovascular Disease is a major problem and is increasing exponentially as the country develops economically. Technical expertise and modern equipment were evident in each of the tertiary facilities. However, length of stay is often prolonged because of complications related to the lack of aseptic technique and the routine practice of administering IV antibiotics for five days post procedure to prevent infection. There also appears to be financial incentives to prolonged hospitalization. The tertiary centers have the best-educated physicians who teach other physicians. They assume responsibility for the education of physicians at secondary hospitals and the secondary hospitals are responsible for the education of physicians at primary hospitals. The physicians at the primary hospitals and the residential primary care clinics in the urban areas are graduates of the Health High School medical education programs as are the secondary hospital physicians in rural areas. Several of the directors of the rural secondary hospitals and the primary hospitals have attended the Da Zhuan program or an additional one to three years of study in the School of Public Health.

The graduates of the Schools of Public Health have some background in health education and often use descriptive posters for education. These professionals include illustrations and limited verbal content for the effective teaching of the illiterate population. Teaching methodology for these patients was often exclusively talking face to face to the patient. Patient education was observed in

several centers for both individuals and groups. The group education observed was not related to cardiovascular disease, but to prenatal teaching.

The residential primary care centers seem to have the most organized infrastructure for follow up for the patients in part because of their close proximity to the patient and home visits are part of the daily routine. However, the data in the residential centers is often not computerized but does track patient visits, diagnoses, care received teaching completed, medication administered and helps provide documentation to the patient.

The cost of screening, other than blood pressure monitoring, is a major barrier to a more complete assessment of the magnitude of cardiovascular disease among this patient population. The cost of treatment is also a barrier for most patients. Costs are paid "up front" and most health insurance requires co-payment for those individuals who can afford insurance. Invasive procedures are expensive relative to salaries. There is also a financial incentive to most physicians for frequent medication renewal visits.

Invasive cardiac intervention provided in the tertiary centers reflects current practice in the industrialized countries of the world with Pacemakers, PTCA, Radio frequency ablation, cardiac surgery including coronary artery bypass, mitral valve replacement, and valve repair, emergency CABG for acute myocardial infarction, Switch and Fontan operations. Cardiac catheterization, some with PTCA, stenting, rotational atherectomy, catheter closure of adult ASD and USA as well as pediatric cardiovascular surgery for correction of congenital cardiac defects⁽²⁰⁻²²⁾. The cost for invasive intervention ranges from 20,000 to 100,000 RMB with patient co-pay of 20% if they have insurance to 100% pay if no insurance. With a national GNP of 620 USD (5084 RMB) and a PPP of 2,920 (23,944 RMB USD) (World Bank 1995), it is clear that invasive cardiac treatment is available to only a few. The national per capita health expenditure is 76 USD (623.2 RMB).

Medications used for cardiac patients include

ACE Inhibitors, AI-R, Beta-blockers, diuretics ranging in cost from 0.43 yuan/tablet to 8.31yuan making the reported average cost for a patient who is generally on more than one medication about 500 RMB/month. For many with a fixed income this is too costly, and this contributes to the non-compliance frequently reported. In addition there are fees per visit generally averaging about 100 RMB, any tests are additional charges. Cholesterol levels are not assessed because of the cost and lack of availability of equipment in many places. No cost was given for tests measuring blood lipids but a cost of 10 RMB was given for a blood sugar strip.

Educational materials are basically non-existent except for a few instruction sheets that are distributed after intervention. Public awareness has been limited and a study in Guangdong province revealed that after elevation of public awareness there was an impact on incidence and compliance with intervention. Non-compliance with medication is a major problem related to the cost of medication as well as the cultural tradition of taking medication only when one does not feel well and patients save medication for "bad" days only.

Diet histories are not routinely part of assessments when screening or during teaching. Diet education is quite general and again accomplished through verbal or written means. Diet greatly influences cardiovascular disease both as a causative factor and as a preventive impact.

Research is being conducted in the tertiary centers. Xi'an did a 10 year study on the population of 5000 cities correlating blood pressure and diet. They randomized groups of patients to use regular salt, salt with magnesium and salt with potassium and their effects on blood pressure measurements. The pilot study concluded that individuals treated with the salts that contained the additives benefited with lower blood pressures than those with regular salt. Unfortunately the study cannot be continued because of lack of funding.

Another study completed in 20 cities indicated that the Chinese in general have elevated

triglycerides yet lower lipids than in other populations. Merck has published a booklet with the guidelines for treatment based on this study. The team was unable to obtain the complete documentation for the study.

Dieticians were not met in any of the centers and little information about them and their role with the cardiovascular patients was acquired.

Nurses working with cardiovascular patients have little to no special education. In Guangzhou, several of the head nurses had been to Beijing to study at First Teaching Hospital. In the surgical intensive care unit the Patient Flow sheets used for vital sign was developed by the Project HOPE consultants of Massachusetts General Hospital, Boston MA. First Teaching Hospital, Beijing University has sent nurses to the US for study. The department has nurses from other areas in China come regularly for training courses, but numbers are limited.

There is a readiness and willingness for a well designed educational program for teaching patients and families about primary and secondary prevention for cardiovascular health. The mandate for this mission is clear from the Ministry of Health but the direction, content and financial support appear to be the responsibility of each unit.

An understanding of the implications of the aforementioned epidemiological data is well established at the primary and secondary institutions visited. In addition the technical expertise needed for the appropriate design of an intervention program, as well as the skills necessary for data acquisition and subsequent analysis exists at a high level at most of these institutions. Nevertheless, the design and effective implementation of a program to favorably impact cardiovascular risk factors at both the primary and secondary prevention levels appears to be limited by a lack of financial resources at the local level and an apparent lack of long term financial support from governmental funding agencies. Although patient education, effective primary prevention, including routine screening for

hypertension, cardiovascular disease, and hypercholesterolemia and continuing patient follow-up would likely be most effective if coordinated by primary care providers at the residential clinics/outposts, these latter resources are currently limited in localized expertise, and by limited funding, and uneven distribution of resources. While at certain centers in Shanghai and Beijing the primary institutions and residential/community clinics were extremely well developed; much more rudimentary, less well funded and staffed and a lack of an organized approach to patient education characterized in many of the other urban and rural setting. Despite financial limitations, pockets of effective primary prevention were seen in certain local agrarian communities around Sichuan and effective implementation of the local community based approach was also seen in Leshan and Chengdu. Although need was evident everywhere, a particular site evidencing tremendous need/lack of financial support was seen in the community surrounding Lhasa. There primary health providers coped with a lack of fundamentals including the absence of running water, and only minimal pharmacological support in their pharmacies and outpatient clinics. Nevertheless, despite severe limitations in financial and staff support, the enthusiasm of individuals providing primary and secondary care in Lhasa was truly remarkable.

Recommendations

The study revealed that additional information is needed from the key professionals in National Organizations to determine what is currently being implemented and by whom, where and with which specific populations. A meeting with Madam Lin an experienced nurse with tremendous insight for this health care system supported the idea that the government is trying to improve the primary and secondary level hospitals and residential care clinics so that once a person has been treated in a tertiary facility they can be followed with secondary prevention in the local community

health care setting. In addition, by improving the primary and secondary care facilities, better care will be accessible for all citizens. Primary prevention is needed for the community at large and should use a variety of methods including media to obtain the attention and interest of citizens. Although in some regions of China these efforts appear to be reasonably effective and coordinated, implementation of these concepts was more rudimentary and fragmented in others.

Recommendations for a program (Figure 6) that utilizes the model of counterparts, an expatriate from sponsoring group or a team with their Chinese counterparts. The success of the counterpart model, which has been well demonstrated by other programs and is well documented in the literature related to sustainable development. An advisory board of experts from China and other countries would assist with the conceptualization and design of the project content and process including facilitating national and international contacts. Incorporated in the model is the need for a major public awareness campaign facilitated through the Chinese media. The train the trainer model would be used to educate doctors and nurses to teach others effective methods utilizing successful materials developed for educating patients primary and secondary prevention. Volunteers in the primary centers are potential communicators to the largest number of the citizens because of their commitment to the health of their neighbors. Clearly the cultural values such as not mixing people of higher rank with those of lower status is a consideration that cannot be

ignored in the design of the program and should be considered with the advice of the counterparts and approval of the senior advisory group.

The design of the program allows for communication between and among the various levels of hospital hierarchy under the advice of the counterparts who will filter and disseminate information. This will provide for accurate accrual of data collection evaluating the Train the Trainer programs by monitoring client compliance, specifically compliance with medication, diet, life style changes including an outreach for non-compliant individuals to reduce the incidence. Performance measures need to be developed for all components of the project. The Train the Trainer programs should also provide for the development of a network of trainers to assure the ongoing continuing education for the participants at all levels. This will facilitate maintaining current information about cardiovascular disease based on published clinical research findings.

Development of educational materials must be a focus of the program. Venues for distribution of educational material must be decided for the program to be effective. Information must not only reach the few who receive health care for diagnosed problems but all citizens.

The start up timeline for the project will be based on the ability to obtain missing data pieces, funding, selection of Chinese counterparts, training sites, trainers, etc. These details can easily be decided once the level of budget is established. The team felt that the program is feasible, the readiness is present, and there is a basic structure and governmental mandate to facilitate a successful program. There are currently many venues available including the internet to quickly develop teaching materials suitable for China some are currently available and in use in a few institutions visited. This project could also serve as an excellent training center for health professional students interested in working internationally.

Although specific recommendations for the project including determination of which of the visited sites would be most appropriate for initial

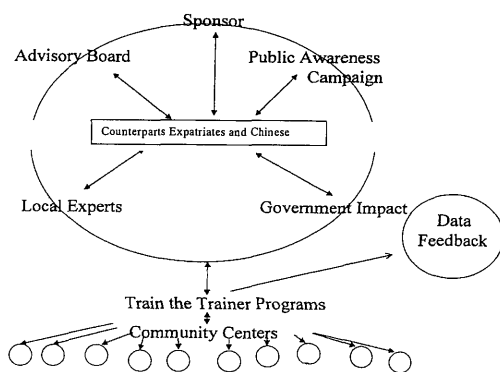


Figure 6 : Model for the National Healthy Heart Country Program

funding is beyond the scope of this assessment team, certain structural components of the project would appear to be essential in order to effectively implement strategies for primary and secondary prevention of cardiovascular disease. These features would include:

1. Involvement of individuals/institutions with expertise in data management so that the efficacy and efficiency of the program can be monitored and enhancements made after initial implementation to ensure staff commitment, patient and continuing education including training of appropriate individuals and effective financial support and screening programs for both primary and secondary intervention. Although primary prevention strategies are imperative for the long term reduction of cardiovascular disease in China, patients with cardiovascular disease who have already been identified by the health care system in China should be included in the program. The effective use of secondary prevention techniques in this patient population will favorably impact a large number of patients. Indeed, most studies have suggested that secondary prevention is the most cost-effective approach in treating cardiovascular disease. All these studies of course have been limited by short term follow-up.
2. The program should be applied in several regions of China optimally in both rural and urban settings so that a variety of effective strategies for different local and patient needs can be developed. Although some uniformity of approach in terms of generalized teaching methods and orientation toward patient education tools is desirable, "a cookie cutter" or boilerplate approach may not be effective for diverse regions of a country as large as China. Flexibility in the local application of these concepts may be helpful in developing the most effective teaching, screening, and training approaches.
3. An oversight mechanism needs to be established to ensure the effective implementation of programs at the local level. This ideally would

involve a partnership between implementing organization and sponsor, The Chinese Government, Chinese and International experts and the funding agency as well as local professional organizations. Although input from such diverse interests is important, functionally the effectiveness of regional application of screening techniques, teaching and patient education will need to be monitored/assessed by a smaller group which could then report to the more inclusive advisory/design group.

4. As noted above, "on line" assessment of efficacy and efficiency and the ability to make interim alterations in project structure in response to changing conditions are key elements of the project. Although the project is primarily one that is clinically and patient oriented, this project will acquire important data of both a clinical and basic research nature that information will need to be acquired in such a way that it can be analyzed effectively. This will certainly require technical (i.e. hardware and software), statistical and physician scientific support.

Summary

A study was conducted in 27 centers in 12 twelve communities throughout China to determine the feasibility of conducting a National Healthy Heart Program for China focused on primary and secondary prevention for cardiovascular diseases. Interviews were conducted with over 150 professionals and patients to determine needs for professional and patient education. Evidence supports the need and readiness for a well designed multifaceted comprehensive program related to cardiovascular disease. The available data clearly indicates the rise in the incidence of cardiovascular disease and invasive intervention is cost prohibitive. Therefore the program's emphasis must be on primary and secondary prevention to limit the rising trend. A program for implementation has been defined.

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