Review

Information and communication technology in cardiovascular disease prevention in developing countries: hype and hope
Report of the International Collaboration on Information Use in Cardiovascular Health Promotion in Developing Countries

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Abstract

Information can be an important tool in promoting a prevention strategy to address the emerging epidemic of cardiovascular disease in developing countries. Advances in information and communication technology offer new promises for global access to information and for global mobilization to prevent and control cardiovascular disease. This is especially true for health professionals, whose needs in areas such as networking, exchange of expertise and access to relevant advances remain unfulfilled. Information technology can also sensitize the lay public to the magnitude of cardiovascular diseases, creating awareness about risk states, and highlighting preventive strategies. Effective application mandates that the technology be relevant to local needs. Cost, feasibility, and relevance of information need to be considered before wide adoption is advocated. Several initiatives, such as ProCOR, Global Cardiovascular Infobase, Heartfile, and the Virtual Congress of Cardiology, have successfully utilized information technology to promote cardiovascular prevention. The experience of these initiatives suggests that, while information technology holds great potential, there are many potential perils, such as the widening global information gap, inequitable access, and irrelevant information. For now, information technology must be viewed as part of a broader strategy, which includes conventional communication media, to address the unmet information needs for cardiovascular prevention globally. Enlightened policies can exploit the energies of the recent information boom for promoting cardiovascular prevention, taking into account the considered limitations.
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1. Introduction

Information and communication technologies offer new possibilities to advance health in developing countries [1–4]. Tools such as e-mail and the World Wide Web can facilitate communication, allow access to health resources for both health professionals and the lay public, promote research, and facilitate management of the rapidly expanding volume of biomedical knowledge [3–5].

In developing countries, currently experiencing a rise in cardiovascular diseases, the use of information technology can be an attractive option to highlight and promote prevention. The aim of this article is to explore the use of information technology in promoting heart health. Drawing on the experience of members of the International Collaboration, we examine cardiovascular information needs,

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identify the potential roles of information technology, and outline the main challenges. We conclude with a set of policy suggestions for the use of information technology to promote cardiovascular disease prevention.

2. The global cardiovascular epidemic: relevance of information

With the aging of populations, the globalization of westernized life styles, and the increasing prevalence of risk factors, a global epidemic of cardiovascular diseases is looming [6–8]. Developing countries account for more than 60% of the global cardiovascular mortality and future trends are even more alarming [9]. In the face of this epidemic, a truly global mobilization is needed to prevent cardiovascular diseases. The lessons learned from the epidemic's course in industrialized countries have to be considered along with locally relevant solutions [10]. Widely disseminated information on the benefits of prevention can inform the health care decisions of both health professionals and the public. Information technology offers new possibilities for disseminating such information in developing countries where journals and textbooks remain prohibitively expensive alternatives [4,11–14]. However, before information technology can be used as an effective tool for promoting cardiovascular disease prevention, the information needs must be considered.

3. Information needs of health professionals

For health professionals in developing countries, there are several critical needs (Table 1) [15–17].

3.1. Timely and reliable exchange of experiential information

Health professionals require timely and reliable access to regional and global experiences. The proliferation of e-mail lists devoted to medicine and health and the broad country representation of their memberships underscore this need.

3.2. Access to relevant advances in knowledge

Access to new information on cost-effective solutions to clinical or public health problems is sorely needed in developing countries. For example, information recently available about the benefits of the relatively affordable beta-blockers and spironolactone for heart failure can be very useful for clinical practitioners [18]. Information has tremendous potential for bridging the gaps in the continuing medical education of health professionals, especially those in remote rural areas.

3.3. Raising awareness

Information technology can be used to increase the awareness of health professionals of the importance of prevention, thereby contributing to a more effective advocacy for a preventive approach to cardiovascular diseases.

3.4. Advocacy for progressive cardiovascular policies

Until recently, efforts to promote cardiovascular disease prevention in developing countries have received little attention, both locally and internationally. This was due, in part, to preoccupation with the ongoing epidemics of communicable, maternal-child and nutritional disorders, but also due to the lack of awareness of the magnitude of the non-communicable disease epidemic and its potential burden on meager economies [19]. Information technology offers a platform for local, regional and international alliances to influence policies in favour of prevention.

3.5. Access to epidemiologic data

Epidemiological surveillance is integral to informing sound policies. Although it has not been adequately

Table 1
Information needs for cardiovascular disease prevention in developing countries

Need	Example
Exchange of experiential information	Exchange of experience in clinical or public health issues
Access to medical advances	Information on locally applicable and cost-effective research and discoveries
Raising awareness	Engage professionals and the public and sensitize them to prevention
Advocacy for progressive policies	Forming alliances to pressure for prevention-oriented national policies
Access to epidemiologic data	Electronic surveillance and databases on cardiovascular diseases and their risk factors
Training and research	Distance learning and access to expertise in conducting essential research
Local and international networking	South–South as well as North–South networking

exploited for this purpose, information technology can facilitate the collection and presentation of epidemiologic data.

3.6. Training and research

The training required to generate a health profession sensitive to the value of prevention can be addressed through distance learning and interactive websites. Similarly, information technology offers access to relevant research tools and experiences worldwide.

3.7. Local and international networking

To be connected and "in the loop" of human communication is an underestimated privilege that those in impoverished countries understand well. Connectivity in this context also has a moral dimension [17].

4. Information needs of the lay public

Information can sensitize the public to the magnitude of cardiovascular diseases, creating awareness about risks and highlighting preventive strategies. However, information technology remains accessible only to a minority of the population due to prohibitive costs and partial or complete illiteracy. This highlights the need to improve equitable access and overcome the barriers of illiteracy. Nevertheless, information technology can be useful in reaching already connected subgroups of the population to reinforce the value of risk reduction. For now, traditional media sources, such as television and print material, and other means of communication, such as health education at the community and village levels, remain the most widely available means for the dissemination of health information to the public.

5. What needs to be done to achieve local relevance?

Adapting information technology for use in cardiovascular disease prevention requires the consideration of several issues relating to local relevance and expressed needs (Table 2).

5.1. Vision

Averting the burgeoning cardiovascular disease epidemic should become a strategic goal of programs and health professionals in developing countries. This needs to be considered within a broader health agenda that also addresses the continued burden of communicable, maternal-child and nutritional disorders, especially among the poorest [19].

5.2. Feasibility

The available human and technical resources and the professional, public and political will needed to exploit information technology for prevention must be considered.

5.3. Community building

More than a technical tool to facilitate access, information technology can also serve to build and strengthen communities of like-minded individuals and institutional networks.

5.4. Relevance of information

A deluge of unmanageable information, much of which concerns high tech treatments or expensive medications, is not applicable to poorer settings. The relevance of information, which emphasizes prevention, both at the population level and for high-risk individuals, and promotes evidence-based cost-effective treatment strategies, is a critical aspect of its utility. Context specificity and availability in local languages can enhance the relevance of information, which are currently dominated by a few languages, limiting wide access. Rapidly developing translation software may partially mitigate this problem, but cultural sensitivity and the effectiveness of the conveyed messages require emphasis as simple translation may not be adequate.

5.5. Information needs of the public

Programs that consider the public's information needs and which address these needs using all available media, both electronic and traditional, help expand the impact of

Table 2
Use of information technology in cardiovascular disease prevention: criteria that matter in developing countries

Criterion	Explanation
Vision	An averted cardiovascular disease epidemic through preventive strategies
Feasibility	Consideration of existing resources and public will
Community building	Like-minded people committed to cardiovascular disease prevention
Relevance of information	Need for filtering through the large amount of irrelevant information. Accessibility in local languages

health information beyond the traditional boundaries of the health care system and its professionals.

6. Programs using information technology to promote cardiovascular disease prevention

Several examples illustrate how information technology can be used to address cardiovascular disease prevention in developing countries (Table 3).

(1) *ProCOR* (http://www.procor.org) is an electronic conference on cardiovascular health in developing countries. A collaborative international initiative based on the pioneering work of SatelLife [20], ProCOR aims at raising awareness and creating a platform for dialogue and information sharing. The emphasis is on prevention and evidence-based, cost-effective cardiac care. ProCOR's reach and effectiveness have been acknowledged [21]. ProCOR partners with local and regional networks, called *AmiCOR*, whose mission is to stimulate grassroots participation in raising consciousness on the centrality of prevention. Especially successful have been the AmiCOR's of Brazil (http://www.cardiol.br/esquina/amifuncor) and India (http://www.amicorindia.org). Through ProCOR, AmiCOR's local experiences are shared globally.

(2) *Global Cardiovascular Infobase* (http://cvdinfobase.ic.gc.ca) provides epidemiological profiles of cardiovascular and cerebrovascular diseases in developing countries. For researchers and policy makers alike, the site provides invaluable information on morbidity and mortality and their trends, distribution of risk factors, demographics, and available health services. This site, as a collaborative effort involving the World Heart Federation, the World Health Organization and the WHO Collaborating Centre for Surveillance of Cardiovascular Diseases in Ottawa, Canada, is being integrated within a global system on the surveillance of non-communicable diseases and their risk factors [22].

(3) *Heartfile* (http://heartfile.org) is the site of the National Heart Foundation of Pakistan and has the unique feature of addressing both the lay public as well as professionals with its messages of heart health. Heartfile is the largest and most widely accessed health-promotion Internet site in Urdu, the official language of Pakistan, but is also available in English. The site posts locally relevant information about cardiovascular disease prevention and prominently features Heartfile's mascot "Hearty" which is complimentary to the social marketing strategies of health promotion campaigns through print and electronic media and other channels.

(4) *Virtual Congress of Cardiology* (http://www.fac.org.ar/scvc) is an Internet-based congress organized by the Argentine Federation of Cardiology [23]. Congresses have been held for the past 2 years and target physicians and non-physicians with updated information on a variety of cardiovascular topics presented in three languages, English, Spanish and Portuguese. The epidemiology and prevention of cardiovascular diseases are emphasized. More than 80% of the participants are from developing countries, underscoring the usefulness of the Internet to reach those without the financial capacity to attend regular conferences.

There are other initiatives which do not focus on exploiting information technology to promote cardiovascular health, but which use this technology to provide and disseminate information of great use in prevention in developing countries. These include: private or academic initiatives such as Epidemiology-Supercourse (http://www.pitt.edu/~super1) which places important emphasis on non-communicable diseases, including cardiovascular, epidemiology; public–private partnerships such as the Initiative for Cardiovascular Heath in the Developing Countries (http://www.ichealth.org) which is devoted to capacity building, research and policy development; and

Table 3
Information technology programs with emphasis on cardiovascular disease prevention in developing countries

Criterion	Website	Languages	Purpose
ProCOR	http://www.procor.org	English	Platform for dialogue and exchange of information
AmiCOR Brazil	http://www.cardiol.br/esquina/amifuncor	Portuguese	Local network of health professionals in Portuguese with emphasis on prevention
AmiCOR India	http://www.amicorindia.org	English	Local resource on cardiovascular disease prevention
Global Cardiovascular Infobase	http://cvdinfobase.ic.gc.ca	English, French	Epidemiological profiles of cardiovascular and cerebrovascular diseases in different countries
Heartfile	http://www.heartfile.org	Urdu, English	Health professional and lay public outreach campaign focused on cardiovascular health promotion
Virtual Congress of Cardiology	http://www.fac.org.ar/scvc	Spanish, English, Portuguese	Updated information for cardiovascular health professional with emphasis on prevention

public bodies such as the World Heart Federation (http://www.worldheart.org) which is an international umbrella organization for cardiac societies and heart foundations. There are an increasing number of cardiovascular journals that provide public access on the Internet (http://www.free-medicaljournals.com/htm/spec2.htm#cardi). However, the list remains disappointingly short and does not include some of the major journals in the field.

7. Potential perils

While information technology can promote the prevention of cardiovascular diseases, its use is not without potential perils (Table 4).

7.1. The information gap

The expanding information gap (mirroring the wealth gap) between richer and poorer countries, and between the "have's" and "have not's" within poorer countries [11,24], threatens to limit the success of serious efforts to use information technology to promote disease prevention.

7.2. Concentration on conduits, not people

A common pitfall of many information technology programs in developing countries is giving priority to building the technical infra-structure rather than to meeting local needs and developing local expertise and ownership [25]. This leads to alienation and exclusion of locals.

7.3. Outreach

Access to information technology may be limited to the urban, educated and well-to-do elite. In the health sector, only urban health professionals, typically physicians, may be able to afford the costs of connectivity [16,20].

7.4. A unidirectional flow of information

A tremendous wealth of experience concerning cardiovascular diseases continues to accumulate in developed countries. While this experience is useful, much of the current flow of information is unidirectional [26]. True dialogue precludes the mere trumpeting of successes by one party and should encourage the exploration of local issues and experiences gained in confronting cardiovascular diseases [27].

7.5. Context-irrelevant information

It has been charged that much of the biomedical and health information available on the Internet, including that which concerns cardiovascular diseases, has little or no relevance to developing countries [28].

7.6. Social costs

Health information technology represents a societal investment in technology aimed at improving people's lives. As such, it competes with other social programs for resources. A potential critique of investing in information technology for cardiovascular disease prevention is that it can detract resources from other health investments. However, investment in information technology is usually private. Nevertheless, public investment may still be needed to address inequalities in access to critical information for health professionals and to support national databases on CVD. Public investment would also do well to prioritize telehealth and teleprevention [29] over telemedicine [30], the demonstrated benefits of which are limited.

Table 4
Potential perils of information and communication technology in cardiovascular disease prevention

Peril	Implication
Information gap	Widening information disparities between the "Have's" and "Have not's" make "catching-up" difficult to achieve
Concentrate on conduits, not people	Lack of attention to the fundamental need for human development before technological development
Limited outreach	With lack of widespread access, it seems that only health professionals, especially in urban centers, and not the wider public can benefit
Passive and unidirectional flow of information	A mere North-to-South information transfer that does not address local needs
Context-irrelevant information	Transfer of information of no or little relevance considering local capacities and resources
Costs	If not used properly, information technology can waste resources, depriving other programs of needed investment
Commercialization	Financial interests may overtake scientific and health interests
Weak information culture	Chronic unavailability of updated health information decreases interest in information

7.7. Commercialization

While private investment in information technology for cardiovascular diseases is needed, there is a risk of commercialization. This is currently reflected in the variable quality of information on Internet sites, much of which primarily serves commercial interests [31].

7.8. Weak information culture

Due to chronic unavailability, interest in current health information, even among health professionals, has suffered in developing countries. Reactivating this interest using information technology becomes an even greater challenge considering access problems.

8. Policy implications

Given the identifiable limitations, a skeptic may question whether information technology is a suitable action tool for cardiovascular disease prevention. We believe it is because: (1) information technology can provide access to information vital to health progress at minimal costs; (2) increasing use among cardiovascular health professionals is already a reality; (3) the majority of investment is shouldered by the private sector; and (4) a minimal level of public investment is required to address emerging inequalities of access. To develop more proactive policies, common themes and priority needs deserve particular attention (Table 5).

(1) Leadership in formulating national policies is required to ensure that these policies address the opportunities and limitations discussed herein, especially inequalities in access, quality of information, and emphasis on prevention and evidence-based cardiac care.
(2) Development of locally relevant information databases for national/regional use that offer quality evidence-based information on cardiovascular disease prevention and care. All potential users must be enabled to access these databases using either public or private portals. Accessibility in local languages is indispensable.
(3) Facilitation of communication networks in cardiovascular disease prevention among developing countries. The International Collaboration, which has carried out activities in several venues, including conferences, to promote a more rational and prevention-oriented use of information, is one such example.
(4) Development of special programs to address the lay public's cardiovascular information needs. Such programs must be part of comprehensive efforts to use all available media, including non-electronic, to promote prevention.
(5) Continuous monitoring to ensure relevance, assess impact, and identify areas for future development.
(6) State agencies, professional and non-governmental organizations as well as responsible for-profit industries must partner to address identified local information needs.

9. Conclusions

Every effort should be made to exploit information technology for promoting cardiovascular health in developing countries. This is already being done by several programs highlighted in this article. However, cost, inequities and other considerations shed doubt on the anticipated success of information technology in addressing the urgent cardiovascular health needs in poorer countries. Until such time when information technology becomes widely available, affordable and accessible, we must continue to use every available medium to reach health professionals and the public. In this context, information technology must be seen as part of a broad strategy to address the unmet needs for cardiovascular prevention worldwide.

Table 5
Policy implications: overcoming current obstacles

Policy theme	Implication
National policies on information technology use	Maximize opportunities for using information technology as a tool in prevention while reducing inequalities in access and utilization
Information depositories	Establish databases that provide relevant information for local use
Communication networks	Support networks that link developing and regional countries such as the International Collaboration
Needs of the lay public	Consider literacy level and use of other available media. Protect public interests from commercialization and misinformation
Continuous monitoring	Ensure proper use and progress towards stated national goals
Partnerships	Join the efforts of public and private sectors, especially non-governmental and international organizations

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