Enabling global health through information and communication technology (ICT)

RAJ SHAH PRESIDENT AND CEO, CTIS, INC

"William Farr in 1850 recognized the value of improving public health through information and communication based registries."

"Mary Lasker in 1950 recognized the value of research for new drugs/treatment in disease management and the value of information and collaboration."

The role of G20 leaders in the new decade will be critical to the collective ability of the international community to address pressing issues of global health disparities. G20 leaders must develop meaningful interventions to ensure access to the essentials of a healthy community. Such interventions can significantly impact on the unhealthy conditions of daily living and lack of basic health education by providing appropriate access to care and information, as well as adequate numbers of healthcare providers. These global healthcare needs extend beyond the communities of the desperately poor and diseases of the poor, such as "HIV/AIDS, Malaria, Polio and mother and child at child birth" to the unique populations in both developed and developing countries, also known as "communities in need" with chronic diseases such as "cancer, heart and diabetes, etc". The "community in need" is generally defined as a community that does not have proper health in its population due to social, economic, geographic, cultural, environmental and type of disease issues. Any global initiatives designed to impact communities in need require a unique and thoughtful vision in approaching population-based health issues and contributing factors of local environment, sanitation, safe water supply, education and social behaviour practices. It is an acute and desperate issue of simple survival for the desperately poor that challenges all countries. Properly handled, the health issues of communities in need will have a substantial positive impact in all other aspects of the community and result in a sustainable framework. This is due to the integration of global knowledge in healthcare through Information and Communication Technology solutions (ICT) with the experience of the local population and awareness of local practitioners (wisdom). As seen in Figure 1, a healthy community has the ability to impact all other aspects of a community's economic and human well-being including defence for bio-terrorism.

Building sustainable and significant improvements in global health in the developing world requires

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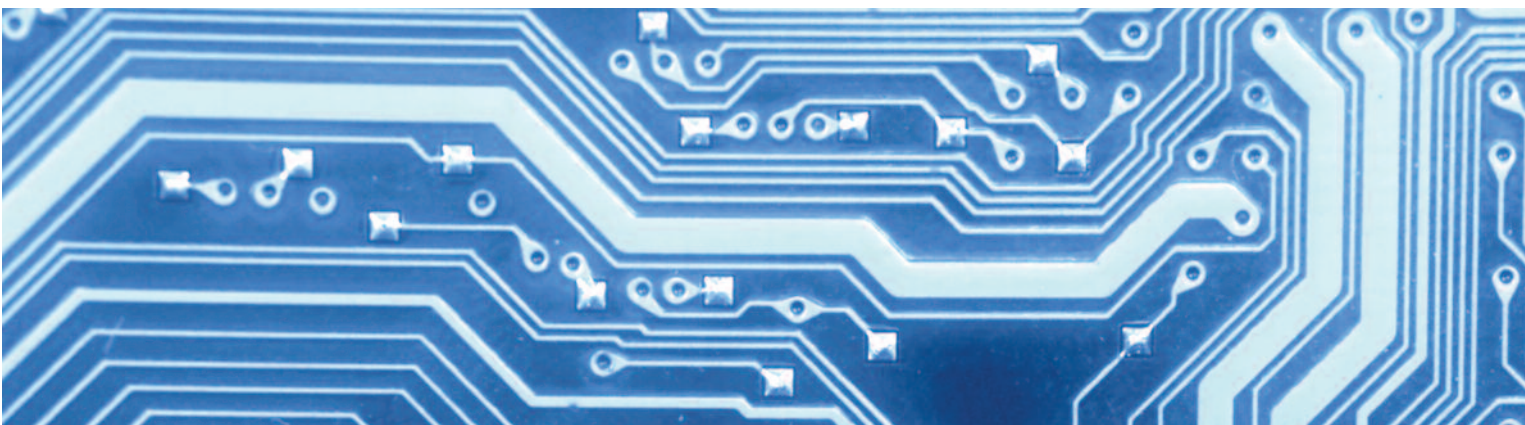
Even in the most desperate communities in need, the population is always committed to education for their children; thus, we strongly need to connect the importance of healthcare needs with education and include health education as the fundamental part of education system

FIGURE 1: HEALTHY COMMUNITY'S IMPACT ON COMMUNITY–SUSTAINABILITY

utilizing the power of modern ICT solutions. The dramatic improvement that ICT solutions have made in other global industries, such as finance, marketing, manufacturing, services and entertainment, yields proven models that can be applied to the health industry worldwide. ICT has the power to drive innovation, collaboration, and transformation within the health industry. If deployed successfully, ICT also has the potential to foster incentives, creativity, and the tenacity needed to drive human capital to solve the tremendous disparities in healthcare delivery. Even in the most desperate communities in need, the

population is always committed to education for their children; thus, we strongly need to connect the importance of healthcare needs with education and include health education as the fundamental part of education system. Specifically, ICT solutions are responsible for building knowledge repositories that will drive the integration and connectivity of public health, healthcare, health research, and health education. This is the foundation upon which sustainable, community-based global health solutions should be built.

Responsible engagement with communities in need

In the past, when designing plans to combat global health disparity issues, we mistakenly borrowed blueprints, which had been successful in developed countries, and simply assumed that we would achieve the same promising results in developing countries. However, these approaches often proved to be completely ineffective because the solution was neither relevant to the environment nor appreciated the concerns of the communities involved. For future endeavors, we must develop local community-based solutions. It is important to recognize that many global and local healthcare organizations have done tremendous work in establishing critical programmes to help numerous individual local communities. While the impact of these investments has by no means

been universal, the models that have had the greatest impact have been those that integrate successful solutions developed by similar communities in need. Reusing these successful solutions and tailoring them to meet individual community's needs will expedite the global solution in healthcare. The potential for funding between the global institutes (USAID and World Bank), the billionaire's philanthropic foundation (Gates Foundation) coupled with Local Government priority investment, will provide the needed funding to combat the global health solution.

To enable the highest chance for success, a targeted plan that addresses the health issues of a local community in need must be developed. This can be achieved by developing a network of healthcare practitioners who have a better understanding of the predominant diseases, health disparities, issues with access to care, and the local culture prevalent in their practice areas. Reusing and customizing the proven power of ICT-based digital health knowledge repositories (systems and applications), collaboration portals, web-based financial/programme monitoring, and social networks can substantially increase the healthcare outcomes as well as return on investment (ROI) in these communities. In the end, it is the community in need that can best determine how to address the common health issues by using other proven models and tailoring interventions to their specific needs.

Effective healthcare ICT solutions in a community in need serve as the central tenet in resolving health issues within the context of existing economic, social, cultural, faith-based, and environmental structures. The model is to build an integrated solution for local healthcare-related problems within a given community through delivering and promoting education and overall enhanced economic well-being.

As depicted in Figure 2, building sustainable healthcare requires having an ICT platform that provides an understanding of five critical factors that must all be taken into account when developing implementable solutions:

1. Economic and social concerns.
2. Political and cultural environment.

FIGURE 2: COMMUNITY HEALTH SOLUTION

3. Resources and environmental conditions.
4. Religion and customs.
5. Availability of health workers and education.

Without addressing all five of these factors, the problems within a given community cannot be solved in a meaningful and durable manner. Changing and improving healthcare, coupled with the education system as the first or beginning priority, will act as a catalyst in solving many other problems within the community, resulting in long-lasting and sustainable positive changes.

In order to deliver a sustainable solution that addresses critical global health needs, investments are required. The typical developing country currently makes the majority of their investments in physical and social infrastructure (roads, clean water sources, energy, manufacturing, etc). Local stakeholders must come to understand the benefits of investing in improving the basics of healthcare through ICT. These investments will be considered liquid assets that, over time, will grow substantially as their physical investment counterparts depreciate. The result will also positively impact the physical and social infrastructure and will continue to build the country's ROI. This clearly includes not only the financial growth, but also a dramatic improvement in human capital driven by citizen empowerment, better

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health, and increased knowledge. In turn, capturing successful experiences into ICT knowledge libraries assists in supporting programmes of economics, education, and social well-being of other "communities in need."

By introducing a culture of incentives for patients, providers, physicians, and communities/governments, positive changes can be implemented and sustained. These incentives can range from financial to technological, and other incentives for the physicians, providers, patients and communities/governments. Finding ways to incentivize providers and physicians should be relatively easy to accomplish because, for the most part, these stakeholders will engage in whatever behaviour is financially advantageous. Incentivizing the patients, however, will undoubtedly be more difficult and will require the utilization of the education and social network-based information and communication technologies. We must engage local governments and other players to help us get a buy-in for patient incentives in these specific communities in need. This will go a long way toward solving health

issues and building sustainable solutions for global communities in need at the point-of-care.

ICT-optimized innovation, collaboration, and transformation accelerators will not only enable but also speed up the process reengineering, organizational development, human resource empowerment, and technology implementation in building global/local learning healthcare solutions. Having the ability to foster communication and collaboration from information brings value to the crucial physician-patient relationship and physician-health system relationship. Using these ICT solutions will give a physician in a developed nation the ability to consult with, diagnose, suggest treatment options and collaborate with other physicians and patients globally and within developing countries. Of utmost importance is the fact that this system will comply with respective regulations, address all privacy issues, and be fully interoperable with current systems in other developed countries. This will permit seamless data capture, warehousing, analysis, and collaboration with other nations that are equipped to provide vital guidance and oversight.

Furthermore, mobile applications, as used around the world for social networking, will also offer a wide variety of benefits, as they can be useful tools in areas, such as outreach, data collection, and patient communication. This will dramatically increase the quality of patient care as well as provide a learning opportunity for local physicians. This same basic idea can also be leveraged in the areas of public health, health research, and health education.

Finally, the overall community in need solution is going to come from the management of a total health ecosystem in the community. Connecting these communities with the adequate use of ICT will enable the building of all encompassing global health solutions. Figure 3 describes the components and their interrelationships in building a sustainable

FIGURE 3: COMMUNITY HEALTH SOLUTION
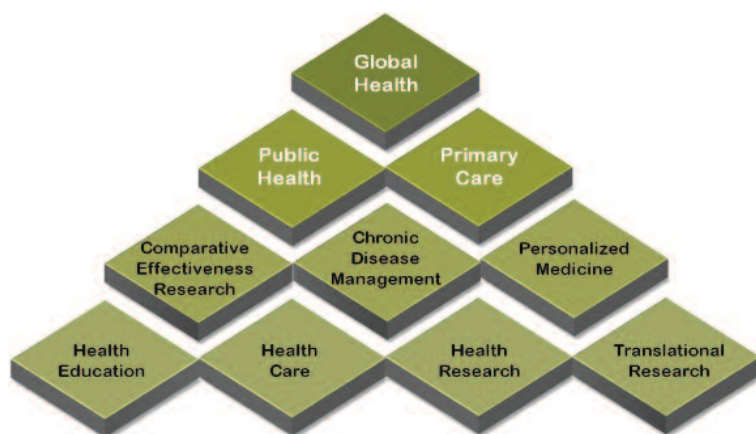
overall local and global health solution.

- The bottom layer describes the core areas of health industry such as health education, healthcare, health research and translational research (integration of health research and healthcare to speed up the new drug delivery and better patient care).

- ∑ The second layer from the bottom is a new paradigm of healthcare that integrates elements from the bottom layer for Comparative Effectiveness Research (being able to choose between several research options that is appropriate for patient cohort), Chronic Disease Management (with 50%-60% of population in diseases such as Cancer, HIV-AIDS, Heart, etc.) and Personalized Medicine (individual patient's care management by integrating lifestyle/behaviour, cultural/ social, genomic/proteomic and clinical/medical information).

- The third layer from the bottom is the first line of defence for healthcare in a community namely public health (prevention, early detection, awareness, outreach, surveillance, epidemiology studies) and primary care.

Final recommendations

It is imperative that G20 countries leverage the benefits of ICT to address global health issues urgently. To that end, the author proposes that G20 countries adopt some or all of the following actions by 2020:

1. ICT Component:

- Improve communication and collaboration between global health institutes, foundations, public organizations, government agencies, and private organizations through the use of ICT tools, such as the internet, portals, and telecommunication devices. This may require new organizations that might be virtual Non-Government Organizations (NGOs) that will cross connect information between all of the stakeholders.

- Complete the global grid by building incentives for telecommunication and the IT industry to encourage and promote the use of telemedicine/telehealth and cross-country collaboration.

- Bring in the value of genomics and bioinformatics through the grid to local healthcare systems for improvement in individualized care.

- Develop cheaper alternatives for useful technology, handheld devices, and tablet PCs, with an emphasis on global health as part of its usage.

- Establish global use of ICT standardization of architecture, regulations, privacy, and best practice standards.

- Invest in building hosted (Cloud) and federated (Grid) interoperable data warehouses that can be provided to the community in need with minimum investments.

- Educate local healthcare stakeholders about the power of analytics and recognize that quality healthcare decisions are based on quality data – and data is only of true value if it can be shared, integrated, reported, analyzed and acted upon to deliver insight and wisdom to advance better healthcare outcome.

2. Public health component:

- Develop a global strategy for implementing local healthcare plans and educating local primary care physicians to provide the best, most comprehensive, and tailored prevention and treatment plan for each patient by building reusable, online, internet-based ICT solutions.

- Utilize ICT in increasing awareness, outreach, registry, surveillance, and control with a move towards building prevention and early detection programmes and epidemiology studies with a commitment to improving quality of care and reduction in cost.

- Establish a virtual network of global first responder centres with online trained health workers who can go into the community and support the community needs (conducting health fairs, teaching self-help breast examination for breast cancer, etc) in public health and healthcare for new diseases and monitor major diseases. These health workers can be trained with a six month to one year certification programme either before or after high school so they have a better understanding on the public health issues integrated with IT and communication

mechanisms to connect within the community.

- Utilize low cost mobile devices that deliver education, monitor patients and coordinate care for chronic diseases, such as diabetes and HIV/AIDS, and early onset of infectious diseases, such as dengue fever.

3. Healthcare component:

- Improve access, intervention, management, and continuity of care with the help of ICT solutions.
- Focus on innovation to help deliver the right information, at right time to the right healthcare stakeholder for best patient care at the point-of-care, leveraging technology such as mobile platforms.
- Dedication to improving the quality and availability of care through the global healthcare experts consultation from physicians all over the world in different time zones with the use of ICT portals and social networks.
- Launch strategic demonstration projects that integrate life-science and healthcare providers within the right cohorts of the community population for major chronic diseases. Establish a virtual network of chronic disease centres that deliver prevention (health fairs) and care management with a commitment to mothers, children, and the elderly population, including supporting palliative care.
- Specifically target patients suffering from co-morbidity and chronic disease with a push towards prevention, which will have the most impact on their well-being while lowering the healthcare costs.
- Provide mobile van and telehealth clinics to cover underserved rural areas.

4. Health research component:

- Integrate clinical research with clinical care with a move towards translational research and personalized medicine with the use of hosted and federated ICT data warehouses and place specific emphasis on chronic and infectious diseases with mothers, children and the elderly population.
- Build ICT-based global data warehouses for clinical research that cover developed and developing countries where the diseases are prevalent and the developed drug and therapy meets the requirements of all cohorts in the community.
- Increase and improve training of local government and industry leadership in recognizing investment value in health research and health ICT and health research-driven reductions in disease management and associated cost reductions.
- Focus on the areas of life sciences, biology, and genomics research in finding new ways to detect predispositions to certain conditions, thereby increasing the ability to prevent such diseases based on global health.
- Utilize the global grid with a specific emphasis on building an Electronic Health Record (EHR) to include clinical, medical, and genomics research data through the ICT collection, integration, management, analysis, and decision support process that is provided free or at minimum cost to local community researchers.

5. Health education component:

• Focus on improving education among patients, physicians, healthcare providers, communities, and governments by leveraging proven ICT mechanisms. Integrate with online education universities and commercial education institutes to perform healthcare training at all levels, making it the highest commitment for the government and the private sectors.

• Build three tier online health education networks that continuously teach and train healthcare professionals for medical and research degree programmes; public health and nursing degree programs; and certifications for health information technology and healthcare support. These three tiers include education at school (K to 12), college, and post graduate advance degree level.

• Educate government leaders on healthcare-driven economic, social, and political improvement benefits and sustainability. The human productivity, process efficiency, organizational effectiveness and improvement of quality of healthcare will not only provide substantial improvement in local and global health, but also help build sustainable economy.

• Utilize the internet and social networks in creating a culture of health awareness and importance across the population.

6. Health policy component:

• Global and local government must make an investment in an ICT-based healthcare system to deliver knowledge libraries and assets that increase value over time. The interconnected local and global health libraries will act as liquid knowledge assets that, over time, will increase in value and provide substantial ROI to investments in government infrastructure and the industries' investments in building ICT solutions.

• Devise an appropriate and lasting incentive plan and make it available in local community for choosing healthier lifestyle options among patients, communities, populations and governments. These incentives should be based on awareness of local needs and must be driven by local practitioners with local experience and

knowledge.

• Develop an appropriate and lasting incentive plan for physicians and providers in collaboration practice value in integrated healthcare.

• Create an appropriate and lasting incentive plan for healthcare payors in global health to see long term ROI value in funding public health and prevention programmes and supporting health disparity.

• Streamline standards and regulations while building a stronger commitment to patient privacy and safety, quality of care, drug efficacy and integrity of information.

The world faces a growing global health crisis that requires urgent attention. ICT and Education promises to solve this crisis by delivering the right health information, to the right stakeholders, at the right time to deliver quality healthcare to the stakeholder that counts the most – the patient. This paper serves as a call-to-action for G20 leaders to address this critically important global issue head-on with ICT and Education. ∎

Raj Shah
is President and CEO, CTIS, Inc