/making:the eHealth> connection*

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# Establishing Partnerships to Promote eHealth in Developing Countries: Lessons from Africa

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*Until lions have their own historians, histories of the hunt will always glorify the hunter.*
African Proverb

*Information is care.*
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**Introduction**

Although health care is considered a service profession, most of what clinicians do is manage information. They collect data (take a history, perform a physical examination, read reports, look up laboratory data, read x-rays), record data (write visit notes, operative reports, prescriptions, and diagnostic test results), transmit data (via telephone, paper or electronic charts, and e-mail), process information to arrive at a likely diagnosis (or hierarchy of possible diagnoses), and initiate treatment. This initial chain of information management is then followed by additional cycles of data collection, management, and processing to monitor and adjust care. Thus, information is not a necessary adjunct to care, it is care, and effective patient management requires effective management of patients' clinical data. According to Gonzalo Vecina Neto, head of the Brazilian National Health Regulatory Agency, "There is no health without management, and there is no management without information." [2]

If a clinician or practice has responsibility for more than a few hundred patients, effective management of clinical care requires some form of computerization. One would never think of running a bank without computers, yet banks manage significantly less information than a hospital or a busy clinic or practice. Moreover, a financial transaction is explicit and unchanging whereas clinical data are fuzzy (does the chest x-ray show pneumonia?), changing (vital signs and most laboratory results), and often contradictory (a patient may have a normal electrocardiogram but laboratory tests that indicate a heart attack). It often takes assessing a preponderance of evidence to arrive at a diagnosis that triggers a cascade of care. This care must then be monitored closely to assess the verity of the diagnosis and the effectiveness of the treatment.

Fortunately, most of the important medical data in the developed world are in electronic format, including dictated notes and imaging test results, billing diagnoses, laboratory test results, and pharmacy data. Whether clinicians can readily access the necessary eHealth data when needed varies depending on whether the needed data are in disparate, often difficult to access systems or are integrated into an electronic health record (EHR). When such data are gathered into a comprehensive EHR, the same data that support one-on-one clinical care can also support collaborative care, practice and hospital management, quality assessment and improvement, financial management, and regulation. Clinicians have the greatest need for the most detailed information. If an EHR can support their information needs, then the secondary data needs (e.g., managerial, evaluative) will also be satisfied by reusing the same clinical data. Except for small-scale

operations with limited numbers of patients, health care systems that lack effective health information systems provide care that is typically inefficient, often incomplete, and ultimately unsatisfactory for both the health care provider and the patient. Information is care, and inadequate information leads to unacceptable care.

Health care providers in the developing world often lack both adequate health care resources and the electronic medical information systems that could help them provide the most care for those meager resources. In countries where per capita spending on health care barely reaches U.S.$10 per year, competition for resources is strong, and human capital is stretched extremely thin. Efficient use of those resources is critical to addressing the fundamental health needs of the developing world. In discussions about EHRs, the question frequently arises: Can a developing country's ministry of health justify paying for fancy computer systems instead of spending it on care? We argue that information – and effective information management – is as much a fundamental part of care as are clinical buildings in which care is delivered. Clinicians spend valuable time (and hence resources) writing notes in paper charts and entering data into registries THAT are seldom available to assist delivering, monitoring, or improving care. These data rarely analyzed or compiled into reports that would be useful for clinical and programmatic decision-making that might improve the quality of care. The health systems providing data to public health registries are thus blind to the actual situations facing their patients and providers. The needs are immense. If the goal of ministries of health is to provide the best possible care to the greatest number of citizens, then their hospitals, clinics, practices, and clinicians must have easy and reliable access to the necessary information, information that the clinicians are already spending time recording but in formats that are not easily accessible. The right to access critical health care information for both the delivery of care and monitoring its results is absolutely necessary if the world has any hope of achieving the Millennium Development Goals[3] or Health For All.[4] For example, to provide adequate care and follow-up of patients with HIV infection, clinicians must know the stage of disease and current therapy for each patient they see, and clinic managers must know which patients are receiving appropriate care, not receiving appropriate care, or are lost to follow-up. For clinics managing more than a handful of patients, paper charts and registries will not be adequate to meet these data needs.

**From Ideal to Real: EHRs for the Developing World**

Can eHealth applications really be implemented and make a difference in Africa? Do cost-effective health information systems exist for developing countries, and do these countries have the capability to implement such systems? The answer to the first question is yes: EHRs are being created for resource-poor countries and corresponding developer communities are being built to facilitate their implementation, persistence and evolution. OpenMRS is perhaps the best current example of an open-source community that supports both software development and its implementation in developing countries.[5,6] OpenMRS has been implemented in more than a dozen sub-Saharan African countries and elsewhere in the developed and developing world. The answer to the second question, however, is still uncertain. Implementation of OpenMRS and other information systems in developing countries has been spotty and has encountered many challenges. It takes significant technical infrastructure, sophistication of technical and clinical personnel, and leadership to conceptualize, design, customize, install, maintain, manage, evolve, and effectively use systems like OpenMRS and the data they store.

Implementing EHRs anywhere requires collaboration among partners with different areas of expertise. However, in developing countries, which often lack basic communication and information infrastructure and the necessary human capacity, implementing EHRs requires active, effective, long-term partnerships in order to bridge gaps in a number of critical domains and cultures. To be most effective and sustainable, these partnerships should be mutually beneficial to both the developed country and the developing country and/or their respective institutions. These partnerships can be categorized as Geopolitical/Financial, Interdisciplinary/Academic, and Private/Public.

**Geopolitical/Financial Partnerships**

As mentioned earlier, the gap in financial resources in the developing world is a significant obstacle to sustainable improvements in health care. The infrastructure and human resources necessary to implement EHRs require investments in information and communication technology, training programs, and ongoing support and mentoring. Each of these areas is a crucial requirement for a successful EHR implementation. Geopolitical partnerships between donor and receiving countries can be problematic. Simply sending consultants or

installing EHR software will never be sufficient to establish an enduring, effective EHR capable of enhancing health care. Although a receiving country can benefit greatly from a one-time augmentation of the technical infrastructure, without training programs and ongoing partnerships these donations create dependency on the donor to continue providing the necessary expertise to keep the EHR running.

The responsibility for enhancing health care in developing countries must ultimately fall upon the shoulders of its own citizens. Thus, North-South partnerships should focus not solely on providing funding or technology but also on training and mentoring so the donor can gradually withdraw from basic aspects of system support and maintenance. An investment in training thus provides a long-term benefit to the developing country. Benefits to the donor country might include strengthening of political ties and a shared clinical and basic science research mission.

**Interdisciplinary/Academic Partnerships**

Maximizing the health of developing countries through the use of eHealth tools requires expertise in multiple disciplines. For example, expertise in public health is necessary to enumerate opportunities for health promotion and disease prevention and identify a country's unmet health needs. Such community-based tasks are often ignored by clinical medicine which usually focuses on delivering the best, most efficient service to those presenting themselves for care, thus missing care that is not being delivered. Yet public health professionals rely on clinicians to care for the sick and administer many preventive care interventions, such as vaccinations.

Other disciplines with critical roles in increasing the number of citizens receiving high-quality care with adequate clinical information are behavioral science, education, communications, computer science and medical informatics, health care administration, health policy, economics, geography, bioethics, and others. No single institution is likely to have expertise – and willing participants – in all of these disciplines. Academic institutions likely cover more of these fields than other, more focused institutions and organizations, and partnerships among multiple academic institutions present the greatest opportunities to meet needs in most or all of these key areas. An example is the American Sub-Saharan African Network for Training and Education (ASANTE) Consortium[7,8] where more than a dozen U.S. universities have joined with Indiana University to create a long-term relationship with Moi University in western Kenya. The schools involved in these partnerships have included medicine, nursing, dentistry, arts and sciences, informatics, and public and environmental health.

The ASANTE Consortium has also effectively demonstrated another aspect of academic interdisciplinary partnerships: mission-based collaboration. Beginning with the inception of the Moi University School of Medicine in 1989, each ASANTE Consortium school leverages its unique resources and capabilities to support and enhance one or more of the three main academic missions: service, teaching and research. Each mission supports the other: A high-quality clinical care venue is also an enhanced classroom for teaching clinical medicine and public health as well as a laboratory for clinical research. Conversely, the training programs enhance the clinical venues with more and better trained health care providers while clinical research programs can (and should) enhance the quality, efficiency, and outcomes of care and prevention activities. This interplay among the three academic missions allows institutional partners to leverage their strengths and be effective without relying on a single institution to provide the bulk of the critical mass necessary to improve care. This may be especially true for implementing EHRs which require a breadth of technical, clinical and educational expertise that few individual institutions might possess.

Through the ASANTE Consortium, multidisciplinary faculty from Indiana University and Moi University created the Academic Model for the Prevention and Treatment of HIV/AIDS (AMPATH)[8,9] which has enrolled more than 70,000 HIV-infected Kenyans (adults and children) into treatment programs at 17 clinics in western Kenya. To manage care for AMPATH, medical informatics investigators from Indiana University and the Regenstrief Institute developed the AMPATH Medical Record System[10] which was the foundation for OpenMRS and currently contains records for more than a million AMPATH visits. With funding from the Rockefeller Foundation, the World Health Organization, and the UN Development Program, these investigators have also implemented OpenMRS in three demonstration sites in Tanzania and three sites in Uganda.

Another example of an effective academic partnership is the Millennium Villages Project (MVP)[11] at the Earth Institute at Columbia University. MVP is a partnership between the Earth Institute, the UN Development Program, Millennium Promise (an NGO) and national

governments in [11] countries in sub-Saharan Africa. It has been designed to help the poorest communities in Africa to lift themselves out of poverty through the implementation of affordable, science-based solutions. MVP has combined programs in agriculture, animal health, education, and infrastructure (including roads, electricity, water and communications), with health care in an integrated and comprehensive fashion. These solutions have been delivered through a network of partners facilitated by MVP. With its need to evaluate and monitor data across many countries, MVP has invested in the development of a multilingual, multinational health information system known as the Millennium Global Village-Network (MGV-Net).[12] Based upon the OpenMRS EHR, but including a common standard dictionary and integration of mobile devices such as cell phones, MGV-Net will provide an important example of how interoperable health information can play a critical role in achieving the Millennium Development Goals.

Partners in Health (PIH) is another example of an effective multidisciplinary academic partnership that has enhanced care through electronic information management in Haiti,[13] Peru,[14] Rwanda,[15] Lesotho and Malawi. PIH has a mission to provide health care to some of the poorest communities worldwide. This includes service, teaching, advocacy and research to address the root causes of ill health and poverty as well as the immediate care needs of patients. PIH has developed and deployed EHR systems in all of their sites with a particular focus on enhancing the ability of clinicians to access and use clinical data such as laboratory results and drug regimens.[16,17]. These systems also help clinicians to recognize deficiencies in care, such as loss to follow-up or the need for laboratory tests, including CD4 counts. PIH has also used the OpenMRS architecture and is currently setting up a training program for information technologists in Rwanda to implement and improve OpenMRS for the needs of the Rwandan health system. A similar training program for data managers is also being developed in conjunction with the Rwandan Ministry of Health. These programs will combine mentoring, hands-on experience and distance learning components for a comprehensive training experience. This is part of an ambitious plan to roll out the EHR system nationwide and involves partnerships with academic institutions in Rwanda, the United States and South Africa.

**Public/Private Partnerships**

Taking a national or global perspective, neither health care organizations, academic institutions, government agencies, philanthropic organizations, private sector companies, nor private donors are sufficient alone to implement comprehensive eHealth solutions sufficient to have a broad impact on health care in developing countries. Partnerships among organizations in each of these sectors can be synergistic and enhance the speed and breadth of improvements in information systems and subsequent health care delivery. Conversely, lack of cooperation between sectors will result in paralysis, ineffectiveness and a waste of resources. The Gates Foundation follows this approach, brokering North-South “twinning” relationships between government agencies, academic and/or civic organizations, the private sector, and health care providers to improve health care delivery.[18] NIH’s Fogarty International Center’s program on Informatics Training for Global Health[19] is another example that fostered partnerships between academic institutions, care providers and government agencies to develop medical informatics expertise to support clinical care and research in low- and middle-income countries. This program was instrumental in creating the partnerships and expertise that led to the OpenMRS collaboration.

Each partner can and must bring its unique positive influence to the relationship, and each partner will have dependencies that the partnership must meet. A hierarchical approach – a one-way north-to-south partnership that does not respect the capabilities and contributions of each partner – is doomed to failure. The primary goal of each partner should be to improve health in developing countries by increasing the number of persons receiving care of continually increasing quality. Sharing such a goal, each member of the partnership can then have its own needs identified and met.

**The Way Forward**

The goal of improved health care delivery in developing countries though electronic information management can seem daunting. Successful efforts such as those described above have taken years or even decades to culminate in effective EHRs supporting clinical care and research. Yet these examples have paved the way for subsequent partnerships that can build on the relationship models, current state-of-the-art technology and software, and the enhanced funding of clinical care in low-income countries (especially for HIV/AIDS). Such partnerships for

EHR development are supported by the general realization – in both developed and developing countries – that enhanced management of critical health data will result in more efficient and cost-effective care that is responsible to those providing the funding and those delivering and receiving the care. As President George W. Bush stated in 2004, *"By computerizing health records, we can avoid dangerous medical mistakes, reduce costs and improve care."* [17]

The way forward in developing new, effective partnerships in eHealth therefore consists of six key steps:

- Disseminating details of successful, sustained and effective partnerships.
- Providing funds for new multidisciplinary relationships between academic, public and private partners.
- Supporting mentoring relationships between successful and new partnerships.
- Developing training programs – including on-site, off-site, and Web-based learning initiatives – to support increasing local capacity for implementing, supporting and evolving EHRs in developing countries.
- Providing regular venues where eHealth partners can share their methods, successes, and failures and create communities for collaboration and mutual support.
- Ensuring local ownership: eHealth initiatives will only succeed and be sustainable – and serve the populations in need – if there is local ownership. Developing country clinicians, health system managers, ministers of health, and even patients must feel that eHealth tools are theirs, created and maintained by them to suit their current and future needs. Through training, mentoring and ongoing support, their international partners must build local capabilities and capacities, not dependencies.

This will take time and sustained effort. As theologian Reinhold Niebuhr stated, *"Nothing worth doing is completed in our lifetime, we must be saved by hope."* [19] Those embarking to improve health care by improving information management in developing countries must have long views and patience. And as former U.S. Secretary of State Henry Kissinger said, *"Each success only buys an admission ticket to a more difficult problem."* [19] Ultimately, we must improve the availability of electronic health information broadly in the developing world, not just in an increasing number of targeted demonstrations. The partnerships sustaining these demonstrations must become part of the fabric of global health care. Finally, President John F. Kennedy stated, *"We choose to do these things, not because they are easy, but because they are hard."* [20] The challenge is daunting; all important challenges are.

If we are committed to increasing the number of people in low-income countries who can receive high-quality health care, then we are committing ourselves to sustained multidisciplinary partnerships across academic, public and private domains that will likely never complete their tasks and the results of which may never be fully satisfied. We can and must be strengthened and sustained by the knowledge that in eHealth we have critical tools for maximizing the benefits provided by the limited financial and human resources available. We have examples of how through effective partnerships we can make these tools available to those who need them the most and have saved and enhanced many lives. In the end, that is enough, for as Benjamin Disraeli stated, *"The health of the people is really the foundation upon which all their happiness and all their powers as a state depend."* [21]

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