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A Toolkit For E-Health Partnerships In Low-Income Nations

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ABSTRACT Collecting, managing, and communicating information is a critical part of delivering high-quality, efficient health care. Low-income countries often lack the information technology that is taking root in developed countries to manage health data and work toward evidence-based practice and culture. Partnerships between academic and government institutions in high- and low-income countries can help establish health informatics programs. These programs, in turn, can capture and manage data that are useful to all parties. Several partnerships among academic institutions and public and private organizations, in areas such as sub-Saharan Africa, Haiti, and Peru, are leading the way.

Donald Berwick, president of the Institute for Healthcare Improvement, has written that “information is care,” not just a necessary component of care.¹ Although health care institutions deliver a service, most of what clinicians do is manage information. They collect data—taking a history, performing a physical examination, reading reports, and deciphering imaging studies. They record data—writing visit notes, operative reports, prescriptions, and diagnostic test results. They process information to arrive at a likely diagnosis and treatment plan. They also communicate with other clinicians and clients through orders, chart notes, consultation reports, letters, and e-mail. Physicians must continually manage information and use that information to monitor and adjust care. “There is no health without management, and there is no management without information,” observes Gonzalo Vecina Neto, head of the Brazilian National Health Regulatory Agency.²

If a clinician or practice has responsibility for more than a handful of patients, this effective management of clinical care requires some form of computerization. Moreover, providing high-

quality care often requires weighing evidence from different sources to arrive at a likely diagnosis, which in turn can trigger an array of interventions requiring coordination by multiple providers. And when such data are gathered into a comprehensive electronic health record (EHR), the same data that support clinical care can also support many other functions, including collaborative care, practice and hospital management, quality improvement, financial management, research, public health reporting, and regulation.

Although developed nations have begun to use electronic health information systems to manage information, low-income nations generally lack advanced tools that can help them achieve better health outcomes. In countries where per capita spending on health care barely reaches US \$10 per year, competition for resources is great, and human capital is stretched thin. Yet we argue that these low-income countries and donors have no choice but to make e-health investments in order to address fundamental health needs. For example, to provide adequate care and follow-up of patients with HIV infection, clinicians must know the stage of disease, comorbid conditions, and current therapy for each patient they see.

Their clinic managers must know whether patients are receiving appropriate care or are lost to follow-up. The pharmacies must avoid running out of the necessary medications. Paper charts and registries are inadequate to meet these information needs for all but the smallest clinics and practices.

In this paper we present encouraging examples of partnerships among institutions in developed and developing countries that are advancing these goals. They are not only putting in place e-health tools to provide better care and resource management, but are also training people to use them effectively. In the long run, these partnerships are more likely to result in the development of human capacity and commitment in developing countries to enable e-health to play a role in flourishing health systems. The partnerships will be more effective than consultants affiliated with private firms who often install proprietary health informatics software, creating dependencies without enhancing the local technical and human infrastructure.

We identify six critical steps that must be taken to advance the work of these successful partnerships. And we identify four obstacles that will have to be overcome to realize the full potential of e-health in the developing world.

From Ideal To Real

Existing global communities of e-health developers have helped facilitate the implementation, continued use, and evolution of EHRs and other tools to support clinical care and public health in low-income countries.

Active, effective, long-term partnerships between institutions in developed nations and regional centers of excellence in developing countries are helping overcome obstacles and leading to further expansion and adoption of e-health. We break these partnerships down into the following categories: interdisciplinary/academic, and private/public.

Interdisciplinary/Academic Partnerships

AMPATH An example of the first category is the consortium known as AMPATH, the Academic Model Providing Access to Healthcare. This partnership includes more than a dozen North American institutions that have established a long-term relationship with Moi University in western Kenya.³⁻⁶ The consortium has enrolled more than 100,000 HIV-infected children and adults into treatment programs at 23 Ministry of Health clinics in western Kenya. It involves schools of medicine, nursing, dentistry, informatics, arts

and sciences, and public and environmental health in nineteen universities in Kenya, the United States, and Canada.

AMPATH has three core academic missions: service, teaching, and research. Each member university leverages its resources and capabilities to support at least one of these three missions. Each mission, in turn, supports the other two: a high-quality clinical care venue, for example, is also an enhanced classroom for teaching clinical medicine and public health as well as a laboratory for clinical research. Some institutions working through AMPATH also specialize in one clinical area across academic missions. One example is the University of Toronto, which leads the consortium's reproductive health collaboration and delivers services as well as carrying out research and teaching activities in this area. Interplay among the three academic missions has allowed the institutional partners to implement e-health tools into sustainable health care delivery and public health programs.

To manage care for the consortium, medical informatics investigators from Indiana University and the affiliated Regenstrief Institute developed the AMPATH Medical Record System.⁷ This system in turn provided the basis for development of another system known as OpenMRS, a nonproprietary, "open source," general-purpose electronic medical record system jointly developed by investigators from the Regenstrief Institute, Partners in Health, and the South African Medical Research Council. With funding from the Rockefeller Foundation, the World Health Organization, and the United Nations Development Program, OpenMRS is in use in more than two dozen countries in sub-Saharan Africa and elsewhere.^{4,8-10}

MILLENNIUM VILLAGES Another example of an effective academic partnership is the Millennium Villages Project, a partnership among the Earth Institute at Columbia University; the United Nations Development Program; Millennium Promise, a nongovernmental organization; and national governments in eleven Sub-Saharan countries.¹¹⁻¹³ The project is designed to help the poorest communities in Africa lift themselves out of poverty by implementing affordable, science-based solutions. In an integrated and comprehensive fashion, the Millennium Villages Project has combined health care with programs in agriculture, education, animal health, and infrastructure, including roads, electricity, water, and communications.

With its need to evaluate and monitor data across many countries, the Millennium Villages Project has invested in the development of a multilingual, multinational health information system known as the Millennium Global Village-

Network, or MGV-Net.¹³ Based on OpenMRS, the network includes a “dictionary” that identifies concepts (such as conditions, symptoms, tests, and treatments) and contains common coding schemes such as the International Classification of Diseases, Tenth Revision (ICD-10) that allow data to be shared between users. MGV-Net also integrates computer-based health records with mobile devices such as cell phones. Having interoperable data allows workers in the field to share data with health care providers in clinics, for example identifying patients with specific health needs (such as pregnancy) who require attention from clinic-based health care providers. Thus, MGV-Net provides an important example of how interoperable health information can play a critical role in achieving the Millennium Development Goals.¹⁴

PARTNERS IN HEALTH Partners in Health, an organization that provides health care to some of the poorest communities worldwide, is another example of a multidisciplinary academic partnership that has enhanced care through electronic information management. In countries such as Haiti,¹⁵ Peru,¹⁶ Rwanda,⁹ Lesotho, and Malawi, the partnership focuses on delivery of health services to meet the immediate care needs of patients, as well as teaching, advocacy, and research to address the root causes of ill health and poverty. Partners in Health has developed and deployed EHR systems in all of its sites, with a particular focus on improving clinicians’ ability to access and use data such as laboratory results and drug regimens.¹⁷ These systems also help clinicians recognize deficiencies in care such as loss to follow-up or the need for laboratory tests.

Partners in Health, which, as noted, codeveloped the OpenMRS architecture, now has an ambitious plan to roll out the OpenMRS EHR system throughout Rwanda. To that end, it has created partnerships with academic institutions in the United States and South Africa. So far, it has set up a training program for informatics technologists 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. To provide a comprehensive training experience, these programs will combine long-term mentoring of the trainees, hands-on experience in developing EHR tools, and Web-based distance learning.

RAFT Another example of academic collaboration is the Réseau en Afrique Francophone pour la Télémédecine (RAFT) program, or Network for Telemedicine in French-Speaking Africa. This network is a collaboration in distance education and telehealth. It is led by the University of

Geneva in partnership with academicians in Canada and twenty countries in Africa.¹⁸ In addition, informatics collaborators in partner countries, led by developers in Geneva, support the technical infrastructure. The collaboration provides weekly Webcasts and individual and group consultations to strengthen clinical and public health systems in participating countries.

ADDITIONAL PARTNERSHIPS Additional academic partnerships to build e-health capacity are being led by the University of Amsterdam (in collaboration with the Universities of Heidelberg, Heilbronn, Minnesota, and Utah)¹⁹ and the American Medical Informatics Association. The informatics association, in turn, created the Global Partnership Program²⁰ in collaboration with the Bill & Melinda Gates Foundation and the International Medical Informatics Association. The Global Partnership Program aims to improve health care delivery and outcomes by increasing local capacity for health informatics in low-resource countries through long-term partnerships between academic institutions in developed and developing countries.

Public/Private Partnerships

Individual health care organizations, academic institutions, government agencies, philanthropic organizations, private companies, and private donors are incapable by themselves of effectively and efficiently implementing e-health solutions to achieve a broad impact in developing countries. Partnerships among such organizations, on the other hand, can increase the speed and breadth of improvements in information systems and health care delivery. To encourage this outcome, the Gates Foundation encourages global “twinning” relationships among governmental agencies, academic or civic organizations, the private sector, and health care providers. One example is Informatics Training for Global Health, a program of the National Institutes of Health’s Fogarty International Center.²¹ This program fosters partnerships among academic institutions, care providers, and governmental agencies to implement e-health tools to support research in low- and middle-income countries. The program, along with other collaborations funded by the International Development Research Centre in Canada, has led to the use of OpenMRS and other widely implemented e-health tools.

The Way Forward

These examples have paved the way for future partnerships that can build on the relationship models as well as the technology and software

previously deployed. New partnerships may also benefit from the enhanced funding of clinical care and public health that is currently occurring in low-income countries through such programs as the U.S. President's Emergency Plan for AIDS Relief (PEPFAR).

SIX STEPS We identify six key steps that should be undertaken, and four obstacles and challenges that must be overcome, for these partnerships to accomplish the most good. The six steps are as follows:

(1) Dissemination of details of successful partnerships, through regular meetings or other exchanges in which e-health partners share their methods and provide mutual support. This is a primary goal of health informatics organizations such as the American Medical Informatics Association and the International Medical Informatics Association.

(2) The funding of new multidisciplinary relationships among academic, public, and private partners. In one example, PEPFAR included in its plans "building the [target] country capacity necessary to implement and maintain a fully comprehensive data use strategy."²²

(3) Support for mentoring relationships between successful and new partnerships. This is a primary goal of the American Medical Informatics Association's Global Partnership Program.

(4) Development of training programs—including on-site, off-site, and Web-based learning initiatives—to support the effective use of e-health tools in developing countries. The Fogarty International Center has funded several centers of excellence in health informatics in developing countries. Stakeholder funding agencies should consider expanding the number of such centers.

(5) Ensuring local commitment. Health informatics initiatives will become sustainable and serve local populations only if those implementing e-health tools have a sense of ownership of these systems and believe that they will ultimately pay for themselves through increased efficiency of health systems. Through training, mentoring, and ongoing support, their international partners must build local capabilities and capacities, not dependencies.

FOUR CHALLENGES Taking these steps will help global health informatics partnerships over-

come the four key challenges and barriers to success, which are as follows:

(1) Cultural differences and geographic distances. These can become major impediments to transnational collaboration. For example, workdays between collaborators on different continents might not overlap, which makes effective communication challenging.

(2) Miscommunication and misunderstanding. These can be common, especially among inexperienced partners. For example, privacy expectations for health care information may vary greatly between cultures. Mentoring by experienced global health partners can help prevent and minimize such problems.

(3) Maintaining funding and momentum for initiatives. Consistent funding can be difficult in resource-constrained countries. Unless a partnership has core funding, ongoing activities will depend on competitive grants and philanthropy, access to which can vary depending on economic trends and government priorities. To avoid dependence on outside funds, developing countries can recoup investments in health information technology through increased clinician productivity that the systems help achieve.²³

(4) Lack of consistent, basic services such as electricity and Internet connectivity. Access to consistent electricity and the Internet is improving in developing countries, and remaining infrastructure problems can be overcome through battery- and solar-powered backup systems and the use of low-cost mobile telephone technology, which is widespread and reliable in most areas of the developing world.

CONCLUDING COMMENTS Establishing effective partnerships in e-health will take time and sustained effort. Those aiming to improve health care by improving information management in developing countries must have patience and take the long view. Ultimately, we must improve the availability of electronic health information broadly in the developing world, not just in an increasing number of targeted demonstrations. Partnerships sustaining these demonstrations must become part of the fabric of global health care. President John F. Kennedy famously stated, "We choose to do these things, not because they are easy, but because they are hard."²⁴ The challenge of global e-health is great. All important challenges are. ■

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ABOUT THE AUTHOR



William M. Tierney

As a doctor, William Tierney spent most of his career thinking locally, not globally—and “never had any desire to get into global health,” he says. But as chief of

medicine of Wishard Hospital, the large, inner-city public teaching hospital in Indianapolis, he had devoted much of his career to helping poor and vulnerable patients who lacked such basics as health insurance. And as senior research scientist at the Regenstrief Institute, an informatics and health care research organization affiliated with the Indiana University School of Medicine, he had been involved in efforts to develop one of the first electronic health record

(EHR) systems in the nation.

So when the opportunity arose to put all those skills to work helping HIV/AIDS patients in East Africa, “I said yes,” Tierney says. He joined a collaboration between Indiana University and Moi University in western Kenya known as AMPATH—the Academic Model Providing Access to Healthcare. The program cares for more than 100,000 HIV-positive patients at 23 sites in Kenya, Tanzania, and elsewhere in Africa. Tierney’s role has been to build an

informatics program, using data generated through EHRs to support clinical care and research.

The EHR system employed in the project, the Regenstrief Medical Records System, was developed at the Regenstrief Institute, located on the main campus of the IU School of Medicine in Indianapolis. The institute was endowed in 1969 by philanthropist Sam Regenstrief, who made his fortune running one of the world’s largest manufacturers of

dishwashers sold under classic brand names such as Sears and Hotpoint.

Regenstrief gave money throughout his life to improve health care. An Austrian immigrant to the United States, Regenstrief, who died in 1988, would undoubtedly be especially proud today to know how his legacy is working toward that goal by spreading e-health throughout the world.