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Building A Health Informatics Workforce In Developing Countries

ABSTRACT **Information and communication technology can be used to improve the quality and safety of health care and to lower costs. But in both developed and developing countries, there is an inadequate supply of skilled individuals who have the technical skills to use this technology to improve health care. Some studies project workforce needs of tens of thousands in English-speaking developed countries, but it is not known what size workforce will be required in the developing world. It is important to identify and develop the skills, training, and competencies—consistent with local cultures, languages, and health systems—that will be needed to realize the full benefits of these technologies. We present a framework for answering these questions and for developing estimates of the size and scope of the workforce that may be needed.**

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One way to bring about improvements in health, health care, biomedical research, and public health across the world is to make use of knowledge and skills in the implementation and use of information and communication technology. The reach of these technologies in the developing world, via both Internet access and mobile phones, is increasing exponentially.[1] However, the size and skills of the workforce have not kept pace. When information and communication technology is used for health applications, it is called e-health.[2] Its application limited to mobile phone technology is called m-health.[3]

Improving Care With Technology

In developed economies, there is increasing evidence, documented by systematic reviews, that information and communication technology can improve the quality and safety of health care while reducing its cost.[4,5] In developing economies, the evidence is less robust, but there are successful applications—for example, from Africa,[6,7] Latin America,[8–10] and the Philippines.[11]

Workforce Needs

One of the challenges to implementing health information and communication technology is the need for a skilled workforce that understands health care, information and communication technology, and the people and organizational challenges involved. The intersection of these areas is commonly known as the discipline of biomedical and health informatics (or health informatics for short).[12] There is also growing evidence for the value that a well-trained health informatics workforce can offer.[13] Educational programs are emerging around the world to meet the need to train such individuals, from graduate education to shorter courses. One example is the American Medical Informatics Association's (AMIA's) 10×10 initiative, a program that aims to train 10,000 health care and other professionals in health informatics by 2010.[14,15]

Additional solutions in developing countries, however, will involve improving education for workers[16] and building workforce capacity.[17] In this paper we highlight some initiatives that are already occurring and that have been described or summarized in the literature.[18–21] These include partnerships with academic centers in de-

veloped countries.[22] We also pose key questions, and we present a framework for how further assessments should be made as to the site, scope, and training levels of the workforce that will ultimately be required in developing countries.

Existing Initiatives

Among initiatives to expand the informatics workforce is the Informatics Training for Global Health Program (ITGH, http://www.fic.nih.gov/programs/training_grants/itgh/) of the Fogarty International Center, U.S. National Institutes of Health. It funds eight partnerships of U.S.-based and international academic programs to expand informatics training in Africa, Latin America, and India.

Another initiative that is defining workforce and capacity needs, with a focus on local partnerships, is the AMIA's Global Partnership Program (http://www.amia.org/GPP/), funded by the Bill & Melinda Gates Foundation. The program's immediate goal is to develop project-centric approaches to training in the developing world. A longer-term goal is to move on to provide advanced-degree training to develop local capacity to continue programs in the future. Partnering with local universities and other institutions is recognized as essential for emerging educational programs and implementing systems in ways that are compatible with local customs, culture, and health care needs.

Unanswered Questions

Despite these important starts, there are still many unanswered questions about how best to implement and use informatics in health: What are the profiles (that is, job roles, competencies, and required training) for the workforce needed to lead e-health projects? What are the valid methods for quantifying workforce needs in developing countries? How can we account for and be respectful of variations among developing countries in culture, language, the nature of health care systems, and the supply of existing resources while still advancing information and communication technology solutions?

Varied health care system needs must also be considered as the system is developed and the required workforce is recruited and trained. What are the basic health literacy skills of citizens and patients? How will people use technology to improve health and interact with health care and public health systems? How will health care and public health professionals use informatics to improve care, interact with citizens or patients, and obtain education? How will informatics professionals develop and implement technology and evaluate its accomplishments in improving health care and public health? What will local leaders and policy makers need to make the best decisions about using and investing in information technology?

The process of answering these questions must be data-driven, using existing research capabilities. Needs are likely to differ among countries, cultures, and political and economic factors, and so will solutions. Planning must include local stakeholders in reviewing the existing research on workforce and proposing a framework to identify the workforce needs in specific developing countries.

Lack Of Research

Despite the acknowledged importance of a well-trained workforce,[23,24] there is a paucity of actual research to guide needs and development. All of the national-level data come from English-speaking developed countries.[25–27] Some U.S. studies have focused on specific segments of the workforce, such as information technology professionals[28,29] and health information managers.[30] It has been estimated that 50,000 additional professionals will be required in the United States to achieve the electronic health record (EHR) adoption goals of the American Recovery and Reinvestment Act (ARRA) legislation.

There are no estimates yet for the total number of health informatics professionals the United States will require over the longer term. More concerted research is needed to better characterize the workforce required, along with workers' specific roles, competencies, and optimal education levels. Similar research is required in the developing world to understand the unique needs in local settings.

Understanding workforce needs in any setting is a challenging task. The first step is to catalog the types of e-health and m-health applications used in specific countries. This includes, for example, basic EHR systems. These may be used to capture data for better clinical documentation that facilitate health care of individuals as well as to aggregate the data for research or public health purposes. Likewise, telehealth applications that provide health care over telecommunications networks have the potential to extend the reach of both basic and specialized care. There is also increasing interest in m-health applications that take advantage of emerging mobile telephone networks.

Approach To Gathering Data

To understand the workforce currently used as well as that ideally required, it would be neces-

sary to visit representative locations where the applications are or will be in use. The first type of data will be purely quantitative, such as the size of each organization, its "product" (health care, public health, commercial software), and its customer base (patients, the public, purchasers of software). In the case of hospitals, we would also need to assess the number of patients, number of beds, and other health care measures. Also, because many health care institutions are tied into public health functions and governments, we will need to understand the specific organization studied in the context of its role in a country's larger health care system.

The next step would be to gather data on the sites' information and communications technology organizations. This would include not just the formal organization, but all who play any sort of role in the provision or support of information or its systems. For example, we would include health information managers and librarians as well as any clinicians involved in technology support. We also need to understand the local and national information and communication technology infrastructure to determine the context of the local applications.

The data collection would need to include counts of people and descriptions of their roles; organizational charts; individual job responsibilities, level of education, perceived shortcomings of their education, and career pathways; anticipated future needs for information technology applications; and types of workers needed and their desired qualifications.

Plan Of Action

With a good picture of the types of e-health applications used and workforce required, we can develop a plan of action. How can we operationalize this? Standardizing learning objectives and competencies, curricula, and job roles across multiple countries or regions will allow achievement of economies of scale as well as sharing of resources and expertise. Certification of professionals and accreditation of educational programs is usually carried out on a national level. However, partnerships under the aegis of international organizations, such as the International Medical Informatics Association and its Working Group on Education, could be the most

efficient approach and would facilitate cooperative exchanges not only between developed and developing economies, but also among developing economies.

An example of the former is the recent translation of an in-depth, online introductory course in biomedical informatics from English into Spanish and its delivery to several hundred people across Latin America. An instance of the latter, collaboration between two developing economies, is the participation in 2008 of around forty professionals from Uruguay in site visits to Argentinean implementations of clinical information systems, and in courses delivered online by Argentinean experts, as one element of the training strategy for a countrywide implementation of clinical information systems in Uruguay.[31]

Broader approaches to training are needed. One promising example is the emergence of a network for the development of OpenMRS, an open-source EHR that is used widely across Africa.[32] An Implementers Network not only coordinates software development but also provides communication, training, and professional development. Larger networks whose interests transcend software development and focus on larger health issues are essential. Other emerging networks, such as the Fogarty Informatics Training for Global Health and the AMIA's Global Partnership Program described above, will also build capacity.

Concluding Comments

E-health and m-health applications hold vast promise to improve global health. As these projects develop, leaders need to be cognizant of the need for a well-trained workforce to lead their implementation. An ideal approach will include needs assessment as well as education and training opportunities for that workforce. Successful local examples can be expanded into larger networks whose scale can be leveraged to more rapidly and effectively disseminate them. Such an approach should also foster the establishment of academic partnerships and centers of excellence in education and research in developing countries for sustainable capacity building while still being responsive to local needs. ∎

NOTES

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