Components of Geonomics and Bio-Informatics

Shankar Srinivasan, PhD
Department of Health Informatics
University of Medicine and Dentistry of New Jersey
Newark, New Jersey

World Health Organization (WHO) on Poverty and Information Technology

Those with the most severe Millennium Development Goal problems are often those with weakest technology and information systems.

It's not because countries are poor that they cannot afford to use information technology.

It's because they are poor that they cannot afford to be without it.

Identifying what is Missing

- Information and communication technologies have not been harnessed systematically to improve the health of populations in developing countries.
- Meager number of healthcare professionals, and healthcare institutions.
- No or very little public access to healthcare information.

Identifying what is Missing

- Typically poor quality and quantity of healthcare data
- 'Brain Drain' of qualified health personnel in search of better standard of living
- The visibility of healthcare research from developing countries is limited

Need for Capacity Building in Health Informatics

- Indeed the lack of well educated and trained human resources in Health Informatics in the Under Developed Countries has been overwhelmingly identified by WHO and others as a great constraint to the sustainable development of information systems and information technology in the health sectors of those countries.

Need for Capacity Building in Health Informatics

- Capacity Building efforts in Health Informatics Education will help in the preparation of health care personnel such that they can make the best possible use of available and new technologies to support promotion of health and equitable health care delivery.

Basis of this Presentation

- We present a Health Informatics Education Framework as one important component of a Broad based Capacity Building Sustainable Health Care Reform Process in a Developing Country.

Basis of this Presentation

- The principal aims of such an education framework are to promote health, provide equitable health care delivery and create wealth in the long run.
- This Framework is based on what is currently implemented in the developed countries.

What is Health Informatics?

- The knowledge, skills and tools which enable information to be collected, managed, used and shared to support the delivery of healthcare and promote health.
- Study of information and communication systems in healthcare. It includes clinical informatics, which focuses on the use of information in support of patient care and bioinformatics, which focuses on the use of genomic and other biological information.

Advantages of Health Informatics

- Innovations for reaching individuals unreachable through the existing health care delivery system and thus provide an equitable
  - Access to health care
  - Management of health, illness and developmental challenges

Advantages of Health Informatics

- With the dictionary of the genome available, the molecular mechanisms of human health and disease will be resolved leading to a transformation in medical diagnostics and therapy.
- Next-generation Health Information Systems will bring together genomic with clinical and epidemiological information for research, policy formation and individualized health care

Important Prerequisites for a Successful Health Informatics Education Undertaking

- In-depth Policy Analysis which includes
  - Identification of all stakeholders and stakes in the healthcare education process
  - Research on contextual political, socioeconomic, and administrative factors likely to influence the outcome of the undertaking

Important Prerequisites for a Successful Health Informatics Education Undertaking

- High level Political and Administrative Leadership
- Adequate time and resources
- Early and consistent monitoring and evaluation
- Starting from existing educational structures and techniques whenever possible

General Guidelines for Incorporating Health Informatics Education

- Conduct curriculum review workshops among educational institutions to harmonize the type, consistency and depth of existing and emerging Health Informatics educational programs. This is to ensure that collectively, these programs can provide the broad range of Health Informatics education and training experiences needed.

General Guidelines for Incorporating Health Informatics Education

- Expand existing/emerging Health Informatics educational programs to include flexible and distance delivery formats especially for health care professionals already in the workforce.
- Integrate Health Informatics knowledge and skills with existing curricula that educate care providers, such as nurses, physicians, pharmacists, etc.

Planning the Educational Process

- In the Development of a Health Informatics Education Framework the following components need to be ascertained:
  - Who are involved in the education process (stakeholders) and who should be taught
  - What should be taught (content)
  - How will it be implemented (process)
- Education in Health Informatics involves both Content: Educating about informatics & Style: Educating people about health care using informatics

Stakeholders

- Health informatics is about information and its use and therefore it is imperative that a clear understanding exists concerning the types of information needed, how it is used, and the roles of the users/stakeholders. The users are very many:
  - Individuals & Families
  - Healthcare Professionals : Physicians, Pharmacists, Nurses, Administrators
  - Donors

Stakeholders

- Health informatics is about information and its use and therefore it is imperative that a clear understanding exists concerning the types of information needed, how it is used, and the roles of the users/stakeholders. The users are very many:
  - Local Communities
  - Governments either of the host country or as donors
  - Health Economists, Researchers, Academia

Stakeholders

- Health informatics is about information and its use and therefore it is imperative that a clear understanding exists concerning the types of information needed, how it is used, and the roles of the users/stakeholders. The users are very many:
  - International Health Care Organizations
  - Vendors of Health Care Products
  - Politicians
  - Other interested parties

Who needs to be educated?

- Health Care Personnel – primary care workers, nurses, doctors, health care educators and students enrolling in healthcare and information science and technology
- Information Systems Personnel
  - Computer Scientists, Technologists, Informatics Personnel
- Public and Patients

Essential Educational Requirements of *Health Care Personnel*

- Acquiring information for practice
- Using emerging technologies to advance practice goals
- Re-engineering practice to capitalize on technology

Essential Educational Requirements of *Information Systems Personnel*

- Knowledge representation
- Emerging technologies
- Integration strategies
- Impact of information and information technology on individuals and organizations

Essential Educational Requirements of *Public and Patients*

- Acquiring, evaluating, interpreting, and applying consumer health information
- Accessing emerging technologies
- Becoming an empowered user of health information

Types of Educational Programs

- Short Term – introduction to the field or for a specific topic of interest (especially for health care field workers and lay public besides professionals)
- Certificate – detailed accredited program
- Master's Level – detailed accredited program for academic and professional advancement
- PhD – detailed accredited program for academic, professional advancement and future innovative and/or leadership roles

Type & Format of Short Courses (very important in Developing Countries)

- Field Healthcare personnel need
  - Both 'just-in-case' information (text books, manuals, websites) for self- or group-learning and 'just-in-time' information (drug formularies, treatment procedures, wall posters conveying clinical practice guidelines)

Type & Format of Short Courses (very important in Developing Countries)

- Field Healthcare personnel need
  - Journals and databases for use at the point of patient care in a wide range of formats – printed material, CD-ROMs, e-learning (email, web files).

Process Step

Curriculum Development for Degree Programs

Goals of a Health Informatics Curriculum

- Improve the understanding of the general nature and purpose of health information management systems including the need for information technology in medicine, dentistry, nursing, pharmacy and healthcare in general;
- Develop ability to locate, analyze and manage healthcare information

Goals of a Health Informatics Curriculum

- Improve awareness of the various uses of information technology in different branches of medicine and the ways in which information technology may meet the needs of healthcare workers;
- Develop awareness and understanding of the legal, ethical, human and social issues associated with the introduction and use of information and communication technologies in health care;

Goals of a Health Informatics Curriculum

- Understand the role and importance of international standards for health records and health data communication and interchange;
- Learn to play an active role in analysis of requirements, needs assessment, procurement and implementation of health care devices and systems.

Process Step

Competency Development

Building Competency

- **Possible actions to build Health Informatics competency at all levels of the health care system are to:**
  - **Identify, recognize and reward experts, leaders, mentors, champions and users for early adoption and use of Health Informatics in day-to-day practice within their organizations.**
  - **Encourage professional associations and colleges to incorporate Health Informatics competency as part of their practice standards.**

Building Competency

- **Possible actions to build Health Informatics competency at all levels of the health care system are to:**
  - **Move toward certification of Health Informatics professionals as entry to practice or career advancement.**
  - **Allocation of time and funds from employers and professional associations so that health care professionals can pursue professional development opportunities or more formal Health Informatics education.**

Process Step

Infrastructure Development

Venture Capital in Health Informatics

- **Seek both traditional and alternative funding sources to invest in the development and adaptation of Health Informatics educational programs. Example sources may include regional governments, health organizations and professional associations as the means for capacity building and professional development.**
- **Need for alliances, partnerships with other developing or developed nations and sustained investment**

Venture Capital in Health Informatics

- **Create strong R&D institution-industry linkages and decentralise centres of knowledge**
- **Support creation of technology parks, centers and incubators promoted by a private industry or through public-private partnership in the form of grant or equity.**
- **Safeguard intellectual property rights and identify local and national innovators.**

Process Step

Regulatory Mechanisms

Key Roles of a Regulatory Organization in Health Informatics Education

- **Setting entry education and training standards**
- **Accreditation of programs**
- **Ensuring continuing professional competence of members**
- **Public Education and Safety**
- **Promote and Reward Leadership in Health Informatics Learning and Practice**

Process Step

Building Public Awareness

Changes in Education

- **Education as a cornerstone:**
  - **Demystify science teaching**
  - **Increase science culture in schools**
  - **At the university level instil and reward research skills**
  - **Promotion of Indigenous knowledge**
  - **Acculturating public to new technologies**

Media & Communication

- **Need to have educated and appropriate media corps**
- **Increase reports and programs on the practice and findings of science and technology**

Media & Communication

- **Dispel misinformation**
  - **Misinformation can lead consumers into life-threatening situations, make them take actions that undermine the effectiveness of their treatment, or in ways that ultimately increase costs of care, and even abandon a provider delivering high-quality care to pursue ineffective therapies.**
  - **Vulnerable people may also be victimized by biased or incomplete information from those with a financial interest in the information they provide.**

Information Resources

- Improving awareness of, and access to, existing information materials is probably the single most important priority in meeting the information needs of healthcare providers.
- Improved access through support for libraries and resource centres at regional and local level.

Information Resources

- Peer reviewed scientific and medical literature are published by scientific societies; local, national, and international publishers. Free and Easy access to such publications is especially important for educators, researchers, the public and policy makers.

Process Step

Evaluation

Evaluation and Monitoring of Educational Initiatives

- All initiatives should be regularly evaluated and monitored to ensure value for money and to extract lessons for future initiatives. Evaluations could adopt a systematic approach, with statements of objectives and outcome criteria against which to assess progress.

Evaluation and Monitoring of Educational Initiatives

- There is a need to develop tools for evaluating the impact of health informatics and other healthcare educational development activities. Community health impact of educational activities can be difficult to evaluate because education is only one of many factors that relate to healthcare practice and improved health outcomes. Valid indicators of effectiveness could greatly increase investment, since funding and scarce resources could be directed to strategies that yielded most value for money.

Evaluation and Monitoring of Educational Initiatives

- Regional, National and International collaborations between institutes of learning can facilitate sharing lessons learned about health informatics education and evaluation approaches.

Conclusions

- Improving awareness of and access to existing information materials is perhaps the most immediate priority for meeting the information needs of healthcare professionals and policy makers in developing countries.
- Capacity Building efforts such as Health Informatics Education will help in the preparation of health care personnel such that they can make the best possible use of available and new technologies to support promotion of health and equitable health care delivery.

Conclusions

- Success in this undertaking will require a concerted effort, cooperation and coordination among the full range of stakeholders involved in healthcare delivery and promotion.

Conclusions

- "All education in a country has got to be demonstrably in promotion of the progress of the country in which it is given."

Gandhi

Conclusions

- "Children are the major repository of human capital for the future. The fact that children are the workers, scientists, parents, leaders and civil society participants of tomorrow means that their survival, health, nutrition and educational progress are key issues for reconstruction and development today"

Nelson Mandela

LOGIC MODEL DEVELOPMENT EXERCISE

What is a Logic Model?

A Logic Model is a diagram or flow chart that shows how a program should work in theory.

"Logic": How do resources and activities lead to results?

"Model": What does the program look like?

A Typical Logic Model

***Program Goal*: overall aim or intended impact**

Inputs	*Activities*	*Outputs*	*Outcomes*
The inputs dedicated to or consumed by the program	The actions that the program takes to achieve desired outcomes	The measurable products of a program's activities	The benefits to clients, communities, systems, or organizations

The Logic Model Conceived As A Series of "If-Then" Statements

Resources	Activities	Outputs	Outcomes
Certain resources are needed to run the program	IF there is access to them, THEN one can accomplish these activities	IF one can accomplish these activities THEN one will have delivered the outputs (services) planned	IF services are delivered as planned THEN there will be benefits for clients, communities, or organizations

Program Planning Using A Logic Model

A Logic Model helps by

- **Demonstrating how a program's strategies contribute to the achievement of intended goals and objectives;**
- **Identifying gaps and inconsistencies within a program;**

Program Planning Using A Logic Model

A Logic Model helps by

- **Providing an effective communication tool;**
- **Involving stakeholders in program planning; and**
- **Building a common understanding of what a program is all about and how the parts fit together.**

Program Evaluation Using A Logic Model

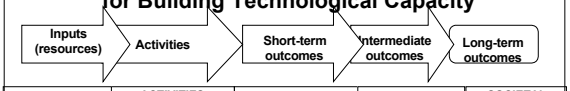
A Logic Model helps by:

- **Matching activities with associated objectives and indicators;**
- **Aiding in the identification of success indicators;**
- **Demonstrating accountability;**
- **Providing a starting point for engaging stakeholders in participatory evaluations.**

When Should a Logic Model be Developed?

- **Early in the planning process to serve as a resource for visioning and priority setting.**
- **Later in the planning process to validate draft goals and objectives and assess the fit between objectives and strategies.**
- **During implementation of a program to assess the evaluation potential of a program or to easily communicate about the program.**

An Example Logic Model: Higher Education for Building Technological Capacity



INPUTS	ACTIVITIES (Examples)	DIRECT IMPACTS (Examples)	INDIRECT IMPACTS (Examples)	SOCIETAL IMPACTS
• Human Resources • Funding • Technology • Management • Leadership	•Collecting Examples of Programs •Designing Curriculum •Teaching on access, analysis & application of healthcare data •Didactic, Practical and Experiential Training •Publishing & Presentations •Educational events/activities •Conferences/ Seminars	• Highly accessible information infrastructure • Scholarly communications • Informed research community • Good National R&D information base • Easy access to leading edge info. For education • Informed decision makers	• Innovative infrastructure • Technology diffusion • Highly qualified professional cadre • Competitive businesses • Productive workers • Job growth	• Economic impacts - economic development & growth • Social impacts -quality of life & wellbeing • Effective Regional or National Policies

A Program Rationale, Goal, Scope and Timeframe for the Logic Model

- **Program Rationale to understand:**
  - **the need and the nature of the problem**
  - **the causes of the problem and the social, economic, political contexts**
  - **the current and past efforts to address the need or problem and lessons learned from these efforts**

A Program Rationale, Goal, Scope and Timeframe for the Logic Model

- **Program Goal: The overall aim or intended impact**
- **Timeframe: A program cycle, year, grant period, a time to show meaningful results**
- **Scope: Geographic area, Service area, Target population**

Outcome Indicators

- **Indicators are the specific, measurable characteristics or changes that represent achievement of an outcome.**
- **Indicators are measurable and observable and answer the question: How will I know it?**

Outcomes and Indicators

• Outcome	• Indicator
• Increased research capabilities	• Volume of health care research increased • No. of new researchers increased • Increased no. of scholarly publications
• Improved Community Health	• Increase in use of health care and clinics • Decrease in the infant mortality rate • Increase in the number of children with immunizations

Logic Model Exercise

Task:

Create a Logic Model to address a specific area of Healthcare Disparity.

Tips:

Keep the Logic Model simple – it should clearly communicate what you hope to accomplish and how you will accomplish it

Show all major connections

Check: Does your logic model make sense?
Does it show a meaningful initiative?

Logic Model Exercise