Global Health Informatics:

Lessons in Developing Scalable, Sustainable Solutions

Based, in part on invited presentations at Mahidol University, Bangkok Thailand 2014 and Namibia Ministry of Health, Walvis Bay, Namibia, 2014

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Overview

• Context

• Responses:
  – Thailand
  – Kenya
  – Peru
  – Namibia

• Lessons learned
The Global Health Challenge

- 1.5 million children under the age of 5 died from vaccine-preventable diseases in 2008 (WHO)
- Every day, about 800 women die due to preventable complications of pregnancy and child birth (WHO)
- Emerging infections such as Ebola, H1N1 to total drug resistant TB threaten to overwhelm health systems globally
- As the world-wide population ages, chronic disease challenges continue to multiply
Health Information Challenges in Resource-Limited Countries

- Siloed systems and lack of interoperability
- Redundant and in-accurate data collection & delayed reporting
- Limited spending on healthcare and eHealth/HIS and competing priorities
- Greater emphasis on public health/prevention
- Increased uncoordinated computerization
- Results-based financing by donors and demands for data
- Desire to move from data-driven vertical reporting to data for community & person-centric prevention & care
Data Challenges: Resource-Limited Countries

- Lack of birth and death (& cause of death) records
- Predominantly print (if any) medical records
- Health information systems investments focus primarily on "counting events" (how many cases of HIV/AIDS, TB, malaria?)
- Siloed monitoring and evaluation systems by disease
- One-way data flow (province/district/national); data THEY COLLECT is not available to health workers on ground and workers not trained in applying evidence to problem
Why Are Global Health Information Systems Critical?

• New viruses travel more rapidly, transforming local afflictions into worldwide epidemics; new and re-emerging infectious diseases (70% of which are zoonoses)

• A modern lifestyle that travels just as fast, contributing to swelling epidemics of non-communicable diseases

• A human resources crisis directly linked to transnational labor, economics, migration and natural disasters

• The growth of vertical (e.g. HIV/AIDS, TB, malaria) initiatives has pushed advances for specific diseases but has also put pressure on individual countries’ public health systems

• Preventing and responding to these threats requires rapid and targeted exchange of accurate and detailed health information

Adapted from: AM Kimball, Risky Trade: Infectious Disease in the Era of Global Trade, Ashgate, 2006
Trade Routes & Cholera Epidemics – 1892*

831 alerts for Alerts from past week

357 Respiratory Alerts
- Influenza (161)
- Hantavirus (14)
- Avian Influenza H5N1 (22)
- Pneumonia (6)
- Whooping Cough (6)
- Avian Influenza H5N6 (6)
- Respiratory Syncytial Virus (6)
- Avian Influenza H7N9 (101)
- Adenovirus (1)
- Tuberculosis (3)
- Legionnaires' Disease (3)
- Swine Flu H3N2 (4)
- Coronavirus (6)
- Swine Flu H1N1 (8)
- MERS (11)
- Respiratory Illness (1)
E-Health Research

• Identify cost-effective and secure information and communications technologies to improve health systems

• Emphasize SCALABLE, SUSTAINABLE solutions

• Information and data collected digitally can be organized, summarized, managed and SHARED more accurately and rapidly than with traditional paper forms and reports
Thailand

• Mahidol University (Faculty of Tropical Medicine) Research and training program development - 2008 – present

• International fellowship and graduate training program in health informatics -- (students from: Thailand, Myanmar, Cambodia, Vietnam, Laos, Philippines, Bangladesh and beyond)

• Research: mobile technology applications to support health workers in border areas AND provide high quality data locally, regionally and nationally
Thailand

Statistics

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Latest data available from the Global Health Observatory

Contact information

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MISSION AND OBJECTIVES

BIOPHICS emphasizes sharing, dissemination and uses of basic and applied aspects of informatics in health sciences field. Its missions focus on 3 areas: training, research and services. In terms of training, the capacity building for health personnel especially those in the region has been arranged by providing workshop and short course certificates; and, in planning for graduate in informatics programs at FTM. Short course and workshops in data management for biomedical and clinical research will be annually provided. For the research and service activities, the center will work in collaboration and networking with other health information centers and institutions, either governmental or non-governmental agencies, in the region and beyond. The research studies focus on the linking between health informatics with bioinformatics, clinical informatics and geo-informatics; the future research agenda is planned to include both animal and human health informatics.

For the coming few years of its operations, the center lists specific tasks and functions to be accomplished as follow:

- To be resource center for training (degree and certificate), R & D and to provide services for health informatics
- To establish standard and interoperable health information system of tropical medicine for the region
- To be informatics reference center of tropical medicine for public access and use
- To develop, manage and disseminate knowledge-based management system and active disease surveillance system of tropical disease for policy and administrative support
- To collaborate and network with other organizations/centers of bio-, clinical, and health informatics
BIOPHICS is the center established at the Faculty of Tropical Medicine (FTM), Mahidol University in February 2008; it is, however, evolved from Data Management Unit (DMU) founded in 1999.

The FTM, since its establishment in 1960, has been well reputed as a leading research institute in various tropical diseases, particularly in malaria, soil-transmitted helminthiasis, liver-fluke infection, etc. It is also well recognised as a leading institute that has productive research in clinical trials in those diseases. Because of the explosive HIV epidemic in Thailand in 1988, some of the Faculty’s researchers have paid attention to this infection as another area of research.

Beginning in 1991, many epidemiological researches had been carried out with collaboration between the Faculty and various other institutes, e.g., the Bangkok Metropolitan Administration (BMA), the HIV/AIDS
Application of mobile-technology for disease and treatment monitoring of malaria in the "Better Border Healthcare Programme"

Pongthep Meankaew1, Jaranit Kaewkungwal1,2, Amnat Khamsirothchara1, Podjadeach Khunthong1, Pratap Singhhasivanon2, and Wichai Satimai3

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The electronic version of this article is the complete one and can be found online at: http://www.malariajournal.com/content/9/1/237

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Abstract

Background
The main objective of this study was to assess the effectiveness of integrating the use of cell-phones into a routine malaria prevention and control programme, to improve the management of malaria cases among an under-served population in a border area. The module for disease and treatment monitoring of malaria (DTMM) consisted of case investigation and case follow-up for treatment compliance and patients' symptoms.

Methods
The module combining web-based and mobile technologies was developed as a proof of concept, in an attempt to replace the existing manual, paper-based activities that malaria staff used in treating and caring for malaria patients in the villages for which they were responsible. After a patient was detected and registered onto the system, case-investigation and treatment details were recorded into the malaria database. A follow-up schedule was generated, and the patient's status was updated when the malaria staff conducted their routine home visits, using mobile phones loaded with the follow-up application module. The module also generated text and graph messages for a summary of malaria cases and basic statistics, and automatically fed to predetermined malaria personnel for situation analysis. Following standard public-health practices, access to the patient database was strictly limited to authorized personnel in charge of patient case management.
Application of smart phone in “Better Border Healthcare Program”: A module for mother and child care

Jaranit Kaewkungwal1,2, Prapat Singhhasivanon1, Amnat Khamsiriwatchara1, Surasak Sawang1,2, Pongthep Meankaew1, Apisit Wechsart3

Abstract

Background: To assess the application of cell phone integrating into the healthcare system to improve antenatal care (ANC) and expanded programme on Immunization (EPI) services for the under-served population in border area.

Methods: A module combining web-based and mobile technology was developed to generate ANC/EPI visit schedule dates in which the healthcare personnel can cross-check, identify and update the mother's ANC and child's EPI status at the healthcare facility or at the household location when performing home visit with additional feature of sending appointment reminder directly to the scheduled mother in the community.

Results: The module improved ANC/EPI coverage in the study area along the country border including for both Thai and non-Thai mothers and children who were either permanent resident or migrants; numbers of ANC and EPI visit on-time as per schedule significantly increased; there was less delay of antenatal visits and immunizations.

Conclusions: The module integrated and functioned successfully as part of the healthcare system; it is proved for its feasibility and the extent to which community healthcare personnel in the low resource setting could efficiently utilize it to perform their duties.

Background

Even though the structure of healthcare system is well organized and distributed throughout Thailand, the system still does not function efficiently in many areas, especially in rural and remote communities. The difficulties in those under-served areas include not only the poverty of the communities but also the limited availability that will increase the accessibility and affordability of healthcare services.

The public health services proposed in the better border healthcare project were corresponding to the goals, in part, of the United Nations - Millennium Development Goals as well as to the public health key indicators of Thailand Ministry of Public Health. Three major
Kenya

Statistics

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<td>4.7</td>
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Latest data available from the Global Health Observatory

Contact information

The WHO Representative
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Health profile

Country statistics
Kenya

- University of Nairobi/UW graduate and post-graduate fellowship program(s) 2008-present
  - HIV/AIDS fellowship program to train leaders from a variety of domains: economics, health management, health informatics, clinicians (CDC funding)
  - New Post-Grad Training Program: Creative integration of ICT tools for Enhancing Research Design, Management and Implementation

- Research
  - Kenya EMR Development and National Deployment
Collaborating Institutions

• **U of Nairobi (UoN)**
  – Institute for Tropical and Infectious Diseases (UNITID)
  – School of Business
  – School of Economics
  – School of Computing and Informatics

• **University of Washington:**
  – Center for Public Health Informatics
  – Department of Global Health
    • International Training and Education Center for HIV (I-TECH)
    • Population Leadership Program (PLP)
    • International AIDS Research and Training Program (IARTP),

• **US Centers for Disease Control and Prevention**
Creative Integration of Information and Communication Tools and Technologies for Enhancing Research Design, Management, and Implementation

Module 1

Introduction: The Role of ICT Tools in Responding to Health Research Challenges
Sherrilynne Fuller, PhD, Professor, Biomedical and Health Informatics
School of Medicine

ICT Tools into Research Program
ICT to Research Program

- Goal: prepare researchers -- health researchers as well as ICT experts-- to effectively apply ICT tools and technologies to health research planning, implementation and management.

- Approach: series of courses (online and in-person) as well as a variety of learning experiences including hands-on classes and mentored experiences

- This first course provides an introduction to ICT in health research with a particular focus on integration of a variety of tools and technologies to improve the research process and, ultimately the quality of research outcomes
Standards and Guidelines for Electronic Medical Record Systems in Kenya
KenyaEMR Distribution

The KenyaEMR is a tailored distribution of OpenMRS which meets the requirements laid out in the Kenya Ministry of Health document: 2011 Kenya EMR Standards and Guidelines. It is currently being developed by I-TECH and has been deployed to almost 140 sites in Kenya.

| Official website | http://kenyaemr.org |
| Downloads        | Google Drive folder |
| Bug tracker      | http://ticket.kenyaemr.org/ |
| Source code      | https://github.com/I-TECH/openmrs-module-kenyaemr |
| Mailing list     | https://groups.google.com/forum/#!forum/kenyaemr-developers |

Installation

Sites that are part of the official rollout will receive KenyaEMR as part of a complete appliance release. This is the recommended way to deploy KenyaEMR in a production environment as the appliance provides other important functionality such as automated backups. However, KenyaEMR can also easily be installed as a distribution release (a set of modules) or built from the source code.

See KenyaEMR Installation Guide for more information.

Modules

The modules that make up this distribution are a mixture of distribution-specific modules, modules which are potentially re-usable by other distributions, and other general-purpose community modules.

See KenyaEMR Distribution Modules for more information.
Namibia

Map

Statistics

Total population (2012) 2,259,000
Gross national income per capita (PPP international $, 2012) 7,240
Life expectancy at birth m/f (years, 2012) 64/69
Probability of dying under five (per 1,000 live births, 0) not available
Probability of dying between 15 and 60 years m/f (per 1,000 population, 2012) 293/204
Total expenditure on health per capita (Intl $, 2012) 619
Total expenditure on health as % of GDP (2012) 8.4

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Country Office website

Health profile

Country statistics
Country profile on regional site

Nutrition

Child malnutrition
Nutrition

Risk factors

Alcohol
Tobacco

WHO collaboration

Country cooperation strategy

pdf
Namibia

- Currently assessing national health information and data status and training needs (CDC support) in response to request from Ministry of Health (MOH)
- Assisting MOH to transition from ICD9 – ICD10 for disease reporting (codeset = less than 1000 concepts)
- Very limited use of e-health records in health facilities BUT…. VERY successful national probabilistic e-records mapping project to assess adverse effects (anemia) of AZT… results used by MOH to determine continued use of AZT versus need to move to more expensive drug (Corbell et al 2011)
Records linkage of electronic databases for the assessment of adverse effects of antiretroviral therapy in sub-Saharan Africa

Catherine Corbell1*, Ishmael Katjitea2, Assegid Mengistu3, Francis Kalemeera3, Evans Sagwa4, David Mabirizi4, Jennie Lates3, Jude Nwokike5, Sherrilyne Fuller6 and Andy Stergachis7,8

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3 Ministry of Health and Social Services, Pharmaceutical Services, Windhoek, Namibia
4 Management Sciences for Health/Center for Pharmaceutical Management/ Strengthening Pharmaceutical Systems, Windhoek, Namibia
5 Management Sciences for Health/Center for Pharmaceutical Management/ Strengthening Pharmaceutical Systems, Arlington, VA, USA
6 Division of Biomedical and Health Informatics, School of Medicine, University of Washington, Seattle, WA, USA
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ABSTRACT

Purpose In 2009, the Ministry of Health and Social Services in Namibia decided to conduct a confirmatory assessment of the risk of anemia associated with zidovudine (AZT)-based highly active antiretroviral therapy (HAART) using records contained in three electronic databases. These records did not share a unique identifying number. The first step was to apply probabilistic record linkage methods to link records in the three databases.

Methods Records of persons, aged 19–65 years, newly initiated on HAART between January 2007 and June 2008, were selected from a pharmacy electronic dispensing tool (EDT) and linked to an electronic medical records database (ePMS) and a laboratory database (MEDITECH). Using the paper-based clinical record as the gold standard, we measured the sensitivity of the starting HAART regimen, that is, proportion of AZT users in the clinical record correctly identified in electronic record, and specificity of severe anemia, that is, proportion of non-cases of severe anemia in the clinical records correctly identified in the electronic record. Kappa and intraclass correlation coefficients were used to determine reliability.

Results A total of 12,358 records were selected from EDT. Seventy-six percent and 58% of EDT records were linked to ePMS and MEDITECH, respectively. The sensitivity of the starting HAART regimen was 98%, whereas specificity of severe anemia was 100%. The reliability scores for variables including weight, hemoglobin, and CD4 counts were moderate to perfect and ranged from 0.59 to 0.99.

Conclusion Probabilistic record linkage methods were effective for records linkage in this sub-Saharan African setting. Copyright © 2011 John Wiley & Sons, Ltd.

KEY WORDS—records linkage; pharmacovigilance; Namibia; antiretroviral therapy; electronic databases
Peru

Map

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Latest data available from the Global Health Observatory

Contact information

Señor Representante de la OPS/OMS
Leanes, Dr Luis Fernando

Health profile

Country statistics

Nutrition

Child malnutrition
Peru

• Graduate Program in Public Health Informatics for Andean Region (Cayetano-Heredia) and UW Masters/PhD program for Peruvian students (Cayetano/UW Partnership)

• Numerous research projects including currently:
  – WawaRed-PERU: “Reducing health inequities and improving maternal care by improving health information system” (Patty Garcia, Jose Enrique Perez, PIs -- IDRC funding)
Historia clínica electrónica, mensajes de texto y voz interactiva para llevar un mejor embarazo.
Some Final Thoughts…

Fragmentation in data collection, management and sharing continues to challenge timely exchange and use of critical data in health systems throughout the world.

A key antidote to the fragmented global health information infrastructure lies in University-based education and R&D programs.

Graduate programs led by Universities in several resource-constrained countries have been shown to be key to creating sustainable national health information systems in a number of countries.

Research foci vary from country to country depending upon needs and capabilities, however, scalability of solutions requires a tight linkage between the national Ministry of Health programs and leadership of research projects.
Selected References

Thank you!!