ESTABLISHING AN INTEGRATED ELECTRONIC HEALTH INFORMATION SYSTEM FOR THE UGANDA POLICE MEDICAL SERVICES

BY

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Declaration

I, Komakech Patrick do hereby declare that this programmatic activity report entitled Establishing an integrated electronic Health Information System for the Uganda Police Medical Services has been prepared and submitted in fulfilment of the requirements of the MakSPH-CDC Fellowship Program and has not been submitted for any academic qualifications.

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Executive Summary

Background

Health information is vital for decision making across all the health system building blocks. The Uganda Police Medical Services uses a paper based health information system based on the ministry of health reporting tools. The current system faces untimely, incomplete and inaccurate reporting. United Nations Population Fund supported Uganda Police to set up an electronic health Information System (eHIS) at the Uganda Police Kibuli ART clinic.

Objective

To general objective was to strengthen technical and institutional capacity for data management and use in the Uganda Police Medical services. The specific objectives were to:

1) Establish an electronic Health Information System for the Uganda Police medical services Kibuli ART clinic by September 2012,

(2) Improve the, timeliness, completeness and accuracy of reports submitted from Kibuli ART clinic to the UPMS headquarters and Ministry of Health and

(3) to improve data management skills of 6 Police personnel in Kibuli ART clinic by September 2012.

Implementation Approach: The eHIS was set up at Uganda Police Kibuli ART clinic and implemented using both modular and pilot and scale-up approach. We reviewed the HMIS form 081 and the M&E framework for the Uganda Police Force HIV prevention strategy and made adjustments to the indicators to align with the data collection tools. This was followed by training of 6 UPMS staff in data management and use of the OpenMRS system. We customisized the OpenMRS system used by ACP-MoH for UPMS, piloted the system and later on commissioned after addressing the short falls identified in the pilot.
Project Outcome

An electronic health information system based on the OpenMRS platform was established. The key attributes of the system are that it supports data entry, data export, cohort management, reporting generation, has a concept dictionary and data security features among others. The system can work as a standalone workstation or can support multiple workstations linked through a server. We have for the start set up a standalone workstation. The system has improved patient management in terms of tracking patient progress on treatment and flagging of patients that are not performing well on treatment. Additionally clinic reports are now generated at a click of a button and data easily analyzed to inform programming.

Lessons Learned

- We learnt that, for staff to embrace a program/system, they have to be fully involved in all stages of its implementation.

- We also learnt that health workers with minimal IT knowledge can be trained on job and perform the basic tasks of managing an electronic HIS

Recommendations

We recommend that this system be rolled out to other Uganda Police Medical Services health units so as to fully attain the goal of this programmatic activity and improve information management and use.

Policy and public health implications

The limited computer knowledge among most of the public health workers should not act as a hindrance to rolling out electronic health information systems.
Acronyms
ACP-UP: AIDS Control Program – Uganda police
AIDS: Acquired Immune Deficiency Syndrome
HIS: Health Information System
HIV: Human Immunodeficiency Virus
HMIS: Health Management Information System
HMN: Health Metrics Network
MOH: Ministry of Health
UNFPA: United Nations Population Fund
UPF: Uganda Police Force
UPMS: Uganda Police Medical Services
1.0 Introduction

A Health Information System (HIS) is a set of components and procedures organized with the objective of generating information for purposes of improving health care management decisions at all levels of the health system[1]. Wilson et al describe a HIS as a set of tools and procedures that a health program uses to collect, process, transmit, and use data for monitoring, evaluation and control[2]. The Health Metrics Networks identifies six components of a HIS (Resources, Indicators, Data sources, Data management, Information products, Dissemination and use of information products), whose main objective is to produce relevant and quality information to support decision making[3].

Health information is among the core components of a health system and forms the basis for public health action and health systems strengthening [4]. Likewise health information acts as the foundation for decision making across all the health system building blocks. Other than serving purposes of monitoring and evaluation, a HIS also serves broader objectives such as providing alerts and early warning capabilities, support planning, stimulate research, permit analysis of trends and assist in reporting among others. For it to be effective, the HIS must provide information that serves the interests of its multiple users such as policy makers, planners and health care providers.

Unfortunately due to under investments in HIS in many developing countries, reports of untimely, incomplete and inaccurate health information is commonplace [1]. Conversely most of the HIS have placed more focus on the quantity and quality of data collected rather than on the use of data for planning and decision-making a situation that limits the role of HIS in providing the needed management support [5]. Donor pressure has also partly contributed to the problem especially in the context of disease specific programs with parallel HIS. Such parallel systems may in turn overburden the health workers due to extra reporting demands [6].

Uganda’s HIS dates back to 1985, at a time when it was a centralised HIS focussed on morbidity and mortality[7]. Based on the need for more
information with an impact on management aspects, the system was reviewed in 1992, 2000 and 2004 with culmination into the current HMIS. Among the aims of the new system was to improve the capacity of health related decision making at the district level in light of the decentralisation policy that was being implemented in the country[8]. With the new system in place, improvements in the aspects of timeliness and completeness of reports were progressively registered. In terms of content the system is paper based at the health unit level where the information is collected using the various HMIS forms and registers and computerisation takes place at the higher levels i.e. the district headquarters and at the national level. The system collects information regarding resource management, logistics and commodities management, Individual client activities and preventive activities for MCH among others. The Uganda Police Medical Services (UPMS) currently uses a paper based HIS that is based on the national Health Management Information System (HMIS). The UPMS paper based health information system faces untimely, incomplete and inaccurate reporting. Similarly the data generated by the system is hardly processed to inform planning and decision making.

With support from Makerere University School of Public Health – CDC fellowship program and United Nations Population Fund (UNFPA), an integrated electronic HIS based on the Open MRS platform was set up for the UPMS.

1.1 Background

The Uganda Police Force (UPF) which was preceded by the Uganda Armed Constabulary became fully fledged in 1906[9]. It currently derives its mandate from the 1995 constitution of the Republic of Uganda under article 212. The roles of the UPF as stipulated in the constitution include protection of life and property, preservation of law and order, prevention and detection of crime, cooperation with civilian authority and other security organs established under the Constitution[10]. As of 2007 the police force had about 48,000 serving personnel.
Uganda Police Medical Services is mandated to provide forensic, curative and preventive medical services to the Police community and its neighbourhood. In terms of health units, the Police medical service comprises of a total of 72 general clinics, these include 4 Health centre IVs, 10 Health centre IIIs and 58 Health centre IIs. These clinics offer the national minimum health care package as stipulated in Uganda’s Health Sector strategic Plan. Besides the general medical services offered by these clinics, they supervise peer educators and behaviour change agents. The Police outposts do benefit from outreach services that are offered by both the regional Police clinics and district Police clinics, a number of partners also offer outreach HIV prevention services to the Police community.

1.2 Literature review

1.2.1 The role of health information systems

A Health information system is a potent tool in improving the effectiveness and efficiency of health service delivery[14] as pointed out by Lippeveld and colleagues who documented an association between effective HISs and improved management practices[1]. This is in agreement with the observation by a number of countries that absence of good information support impedes vigorous and objective management[15]. Furthermore, following the 1978 WHO Alma Ata declaration, the development of HISs was recognised as one of the strategies needed to inform allocation of resources and priority setting, in addition it was advocated that for HISs to be effective a decentralised approach had to be taken. This in essence meant taking decision making closer to the communities utilising the health services through use of information at the point of collection[1, 16].

In addition, the introduction of performance based disbursements by a number of international initiatives has further underscored the role of health management information systems as it is a requisite for programs to report progress towards set targets [17] (HMN, 2006). Walford[18], further stresses the role of improved health information systems in providing accountability for expenditures on health, increasing aid effectiveness through more efficient
fund allocations and increasing interest in performance based disbursements. Besides the role of health information systems for accountability, they are also used as a management tool for purposes of improving outcomes through analysis of the observed changes [19].

Support to planning and decision making and improved quality of and access to health care were key among the benefits of the HIS reported by nurses and doctors during an evaluation of the Health Management Information System of the Uganda Catholic Medical Bureau[14]. Similarly Kanjo et al documented the value of health information in the mobilisation and allocation of resources, prioritization of health programmes and research, and improvement in efficiency and effectiveness of health programmes[20]. Health Information Systems can serve a critical role in addressing health inequities, more especially when such systems are able to provide reliable longitudinal and representative data that link measures of health with measures of social status or advantage at the individual level or in a given geographical area[21].

1.2.2 Electronic Health Information Systems
Electronic health information systems are singled out as one of the various ways in which information technology (IT) can be applied to improve the health system, the role of IT ranges from aiding service delivery, data collection, storage, analysis to the dissemination of information. Wilson highlighted the role that can be played by IT in improving the quality, timeliness, clarity and presentation of information in computerised HIS[22]. Electronic health information systems are mainly categorised into electronic medical records, aggregate data based HIS and name based HISs[23]. Manual or paper based HISs have been labelled inefficient and time consuming, on the contrary improved accuracy, timeliness, reliability and integrity of data are attributes that have been associated with electronic HISs. This is because most electronic HISs have inbuilt systems to check the accuracy and completeness of data.
Health workers using an electronic HIS in rural India spent only one hour updating records as compared to two hours while using the manual system. In the same way the system was associated with improved service delivery given its capabilities of generating reminders for ANC, immunisation and family planning client follow up, in addition to generating work plans. In terms of returns on investment it was noted that the improvements in service delivery and the time savings associated with the system could offset the set up costs within a period of two years[23]. Other authors have also reported accounts of time savings and improved service delivery following establishment of electronic HISs[24], Singh et al documented improvements in MCH service delivery following the introduction of an electronic HIS in India, with the system being associated with reductions in the cost of a fully immunised child due to improved efficiency[25].

1.2.3 Setting up Health Information Systems

A number of stepwise approaches for the implementation of HIS projects have been documented. These approaches include modularity (supporting one healthcare function at a time), incrementalism (providing stepped levels of support for healthcare functions) and pilot and scale-up (supporting one location first and then gradually rolling-out to other locations)[26]. These stepwise approaches have been associated with the successful implementation of HIS projects by a number of authors[27, 28], some of whom state that these steps avail a framework within which one can position a process of learning; of reflection on the current state of design and current state of reality, and of improvised action to address identified gaps[26].

Similarly participatory approaches that bring together the intended users and the designers of the HIS and therefore availing the intended users an opportunity to understand the HIS design and the designers an avenue to comprehend user experiences have also been associated with successful implementation of HIS projects[29]. Disregard of participatory approaches when developing HISs may lead to failed HIS implementation[30]. On the
other hand, Biehel linked top management support, staff training and good user attitude to successful implementation of information systems[31].

1.2.4 Sustaining Health Information Systems

A number of projects establishing electronic HIS in developing countries have encountered challenges of sustainability[32, 33]. Reynolds and Stinson defined sustainability as maintaining something that already exists over time without the need for outside support to guarantee its existence[34]. The aspect of sustainability of a HIS has to be thought through and addressed right from inception through to the various stages of design, development and rollout in order for the system to outlive external support[35]. The ability to provide reliable and useful information and the capacity of users at all levels to effectively use the system has been advanced among the factors necessary for the sustainability of an electronic HIS. Similarly institutionalisation which is a process through which a social order or pattern becomes accepted as a social fact[36], if pursued can result into more sustainable HIS that can continue function without external support[37]. Institutionalisation of HIS creates roles, responsibilities and budgets that promote the integration of the HIS into the routine organisational culture which in turn foster the sustainability of the HIS[35].

Krishan et al, recognised a clear understanding of the benefits of the HIS, strong commitment of the HIS team and regular updates to the HIS to accommodate the changing organisational information needs as the factors responsible for the sustainability of an electronic HIS in rural India that had been in place for twenty years[23].

While donor support has been instrumental in the development of HIS in developing countries, most of such donor funded projects have pursued a top down approach with very limited involvement of the bottom level users[38]. This creates an environment of limited ownership and control by the intended users which negatively impacts on the sustainability of the system. Both Limited resource allocation to HIS by governments or organisations following withdrawal of donor support and a strong focus on the technical aspects of the
HIS rather than user needs have been identified as factors that impede sustainability of HIS[35].

In Uganda Gladwin et al reported that overemphasis on the technological rather than organisational issues, limited support for use of information at the point of collection, target setting at national level as opposed to the local level as the major constraints encountered during the HMIS improvement process[7].

While the quality of data produced is a key benchmark in the performance of a health information system, evidence of continued use of the generated data to inform decision making and improvement of health system performance is equally important. Loevinsohn[39], reports that more than half of 168 mid-level managers from a developing country who participated in a study could not use the health management information system for tasks as simple as identifying the best and worst performing districts under their jurisdiction and therefore underscores the need for incorporating information use for decision making as part of the system and not a component that should be thought of after. Additionally, the need for simplifying health information systems to the end users can not be over emphasized.

1.3 Problem Statement
The Uganda Police Medical Services was using a paper based record keeping system based on the Ministry of Health HMIS data collection instruments. The system was facing a number of challenges; key among the challenges was that the data collected would hardly be processed to get information for guiding planning and decision making at all levels. Furthermore, up to 70% and more than 90% of the reports that were submitted from the Police health centres to UPMS headquarters were late and incomplete respectively.

Additionally the HMIS data collection forms that were in use were not adapted to capture all the HIV prevention activities in the UPF. The Police medical facilities do offer services to both the Police personnel and other individuals including family members of Police personnel and communities living in the
vicinity of these Police clinics. In the absence of unique identifiers it was difficult to quantify the exact service utilisation patterns of the police personnel, yet such patterns when analysed, could identify salient programming issues in service delivery. Similarly, HIV prevention services that were offered by partners to the UPF especially through outreaches are not recorded by the current system. This therefore points to a scenario of under reporting.

A skills gap with relation to basic data processing, analysis and use of data for decision making existed in the Uganda Police Medical Services. This coupled with the poor data collection and reporting practices of the responsible officers contribute to the incompleteness and delays in submission of reports and ultimately impeded use of information to inform decision making and made monitoring of the HIV prevention response difficult.

Furthermore it was hard to get information regarding the scope (numbers reached, geographical coverage, quality and utilisation) of curative and prevention services in the UPF, this difficulty in accessing information could have led to non-evidence based decision making and inequitable service delivery.

In light of the aforementioned challenges at the time, a review of the UPMS indicators and data collection instruments was undertaken and subsequently streamlined to encompass all the information needs of the UPMS. Uganda Police Medical Services staff were trained in data management and a web-based electronic HIS based on the OpenMRS platform was setup. This addressed the inaccuracies and incompleteness through the inbuilt quality assurance measures in the electronic system and validation of the summary forms at the point of data collection. The skills gap was addressed through training of the UPMS staff in basic data collection, processing and analysis skills.
1.4 Project justification
The uniformed service that includes the Police is one of the key populations in relation to high risk and HIV interventions in Uganda. However, tracking of progress of HIV interventions in UPMS has been limited by gaps in its HIS. This programmatic activity is line with the UPF HIV prevention strategy (2011-2015) that identifies the development of a robust monitoring and evaluation system for the Uganda Police Medical Services as one of its priorities[40]. Besides improving timeliness, completeness and accuracy of submitted reports, it is hoped that the embedded data analysis and report generation functionalities in the electronic HIS will enhance use of data for decision making. Additionally the lessons learnt during the implementation of this project will inform the future rollout of the system to the other Police regions.

1.5 Conceptual framework
The conceptual framework is based on the results chain model. It is envisaged that addressing the challenges facing the UPMS HIS through review of data collection tools and indicators, training of the Police personnel in data management and development of an electronic HIS would lead to improved data management in the UPMS and improvements in timeliness, completeness and accuracy of submitted reports and an overall improvement in efficiency and effectiveness of UPMS programming. An illustration of the conceptual framework is shown in figure 1 on the next page.
Challenges of the current system

- Deficient data collection tools and indicators
- Incomplete and inaccurate filling of registers and summary forms
- Untimely and incomplete reporting
- Inadequate skills in basic data processing and analysis

Processes

Outputs

- Appropriate Data collection tools and performance indicators
- Staff trained in data collection, processing and use of the eHIS
- A functional electronic HIS developed

Outcomes

- Improved data management skills in Uganda Police Medical Services
- Timely and complete Reporting to Uganda Police Medical Services

Goal

Increased effectiveness and efficiency of the Uganda Police Medical Services
1.6 Project goal
To improve efficiency and effectiveness of the Uganda Police Medical Services

1.6.1 General objective
To strengthen technical and institutional capacity for data management and use in the Uganda Police Medical services

1.6.2 Specific Objectives
1. To establish an electronic Health Information System for the Uganda Police medical services Kibuli Anti Retroviral Therapy (ART) clinic by September 2012
2. To improve the, timeliness, completeness and accuracy of reports submitted from Kibuli ART clinic to the UPMS headquarters and Ministry of Health
3. To improve data management skills of 6 Police personnel in Kibuli ART clinic by September 2012

2.0 Methods

2.1 Project setting and beneficiaries
This programmatic activity was implemented in the Uganda Police Medical Services Kibuli ART clinic. Kibuli ART clinic is the only Uganda Police facility presently offering ART services to the Police community in the country. The clinic has enrolled 300 patients of whom 196 are receiving ART.

The primary beneficiaries of this project are Police community and other persons that access services from Kibuli ART clinic. These will benefit from the improved service delivery as a result of the improved health information management at the facility. The Uganda Police Medical Services will benefit through timely and complete reporting, use of data for decision making and planning.
2.2 Project implementation approach
The electronic HIS was implemented using both the modular approach (in this case initially designed to cater for the medical services currently provided in Kibuli ART clinic, but with provisions of upgrade whenever a new service is brought on board) and the pilot and scale-up approach (in this case starting with the Kibuli ART clinic before the system is scaled up to cover the other Police clinics)[26]. However the scale up phase will be carried out later and is therefore not part of the programmatic activity.

2.3 The OpenMRS system
The Open Medical Record System (OpenMRS) is the software platform that we used to design the UPMS HIS at Kibuli ART clinic. OpenMRS is an open source medical record system developed in 2004 by Regenstrief Institute and Partners In Health. OpenMRS is used in over 15 countries worldwide Uganda inclusive.

OpenMRS enables design of customised medical record systems that allow data to be stored in ways that makes it easy to analyse. The OpenMRS system has a number of features which include data entry, data export, cohort management, reporting tools, data security and concept dictionary among others. The system can work as a standalone workstation or can support multiple workstations linked through a server.

Ministry of Health (MoH) already has in place an OpenMRS system operating at a number of its public and partner ART sites. We customized the system used by MoH for the ACP-UP Kibuli ART clinic. The screen shots below show interfaces of the OpenMRS system installed at Kibuli ART clinic
Screen Shot 1: The log on interface

Screen Shot 2: Patient encounter interface

Screen Shot 3: Integrity checks interface

Screen Shot 4: Report generation interface
Figure 2: Schematic presentation of the system set up.

- System tracks patient care and clinical outcomes with abilities to flag patients who may require additional attention.
- Generates lists of patients scheduled for appointment
- Forecasts and manages drug inventory needs.
- Analyse data and generates reports
- Generates reports as per the reporting requirements of MoH and UPMS headquarters.
- Planning and decision making

Patient information fed into the OpenMRS system

Patient consultation: Health worker reviews patients based on the MoH paper forms.
2.3.1 Review of indicators and data collection instruments
A two day workshop was undertaken with the Uganda Police Medical Service personnel were indicators and data collection tools were reviewed. We reviewed the HMIS form 081 and the M&E framework for the Uganda Police Force HIV prevention strategy and made adjustments to the indicators to align with the data collection tools.

The purpose of this review was to ascertain if the tools and indicators in place answer all the programming requirements of ACP – Uganda Police. A participatory approach was followed under guidance of an M&E/quality assurance officer from ACP-MoH. All the indicators and indicators and tools were reviewed.

On conclusion of the exercise it was agreed that the current tools answer all the programming requirements of ACP-UP AIDS clinic. However it was noted that they were no unique identifiers for Police staff and none Police staff accessing services from the Kibuli AIDS clinic. It was agreed that all Uganda Police staff have letter “P” appended at the end of their clinic numbers to distinguish them from non Police staff.

2.3.1 Training
A total of 6 Police Personnel were trained. The training focused on the areas listed below.

1. Data collection.

2. Data processing and analysis.

3. Use of data for decision making.

4. Data storage and retrieval.

5. Use of OpenMRS .

6. Maintenance of OpenMRS.
2.3.1.1 Data collection
Emphasis was placed on complete and accurate filling of data collection forms. All the medical forms used in the Police Clinic were reviewed, discussions were held on how they should be filled. 12 patient records were randomly selected and members requested to identify errors relating to incomplete and inaccurate form filling.

2.3.1.2 Use of OpenMRS
A background to HIV/AIDS care information systems was provided. This was followed by an overview of the OpenMRS system that included training on the following aspects

2.3.1.3 System requirements, system installation and initial system setup

2.3.1.4 Patient registration and management
- Data Entry Summary Page
- Data entry Encounter page
- Data entry Education page
- Data Validation

2.3.1.5 Report Generation
- Facility ART Register Report
- Facility Adherence Report Facility Appointment Lists Report
- Facility Death List Report
- Facility Early Warning Indicators Report
- Facility HIV Quality of Care Report
- Facility Missed Appointments Report
- Facility Pre-ART register Report
- Facility Proportion of Family Members Tested Report
- Facility Transfers Out List
- MOH Quarterly Cohort Analysis Report
2.3.1.6 Other reporting (Cohort Builder) and Data export

2.3.1.7 Data Backup and Restore

During the training participants were given opportunity to enter data, generate and analyse reports. Ongoing support supervision and technical assistance is still being provided to the records assistants who are feeding the information from the patient files into the OpenMRS system.

Clockwise: Patrick making a clarification during the OpenMRS training session and UPMS staff in an OpenMRS practice session.
2.3.2 The system
The HIS that has been setup at Kibuli ART clinic is based on the MoH OpenMRS platform, using MoH data collection interfaces.

We setup a system based on the OpenMRS platform, using MoH data collection interfaces. The HIS set up is presently based on one work station and is dual in nature i.e both paper and electronic. At the point of data collection the clinician enters information into HMIS form 081 and thereafter the forms are entered into the system by records assistants on the same clinic day, this after verifying completeness of the form. Whereas the OpenMRS can be used at the point of data collection, this was deemed unfeasible at this point, reason being that Kibuli ART clinic does not have a standby generator or an inverter system in case of power failure which wouldn’t render the system useless in such circumstances. Secondly we set up only one work station which makes it impossible for more than one clinician to feed data into the system at the same time.

2.3.3 Data security
The computer is housed in a secure room and the hardware and software setup is access controlled with multiple passwords i.e. boot time password and OpenMRS application access password. Access privileges were assigned in
relation to the different administrative responsibilities of the personnel that access the system. These privileges are

- Data entry- roles limited to data entry
- Provider- Provides care to the patient
- Data Manager- Generates reports and can do cohort analyses
- System developer- Can make changes to the program e.g. create new forms.

Weekly data is backed up onto optical disks. Anti-virus software was installed on the workstation and is regularly updated.

### 2.4 Ethical considerations

This programmatic activity was reviewed and approved by Makerere University School of Public Health Higher Degree Research and Ethics Committee and as well by the management of UNFPA and Uganda Police Medical Services.

### 2.5 Sustainability

The Uganda Police Medical Services staffs were involved in all the stages of planning, design and implementation of the system, this created a sense of ownership and control among staff of UPMS. Further senior Police management was briefed about the importance and benefits associated with the electronic Health Information System. This supported the institutionalisation of the system. The engagement of both UPMS staff and senior management bore fruits in form of two new records assistants who were deployed to the AIDS clinic to support data entry into the OpenMRS system.

### 2.6 Lessons Learned

We involved the UPMS staff and management in the conceptualization, planning and implementation of this programmatic activity and as a result the program was well embraced by both staff and management. Before the program was implemented, the unit lacked full-time records assistants, but as a result of engagements with UPMS management two full-time records assistants
were assigned to the unit. Therefore we learnt for a program to succeed both staff and management need to be involved in all stages of the project cycle.

The records assistants that were assigned to UPMS had very limited computer and data management skills. Nonetheless through training on site mentoring their skills in IT and data management were improved and they are ably running the system. We therefore learnt that health workers with minimal IT knowledge can be trained on job and perform the basic tasks of managing an electronic HIS

3.0 Recommendations
We recommend that the UPMS together with her partners roll out the Health information system to the other UPMS health units. This will improve overall health information management, planning and decision making in UPMS lead to more efficient service delivery.

3.1 Policy and public health implications
The UPMS staff more especially the record assistants had very limited computer knowledge. However with training and onsite mentoring their skills computer and data management skills were improved. Limited computer skills among health workers in public facilities should therefore not act as a hindrance to rolling out electronic health information systems.

References


