

The Malaysian Immunization Registry and Tracking System (MIRTS) – Keeping Malaysians Healthy

Zaitun A. B.¹ and M. S. Termanini²,

Department of Information Science¹,
Fac. of Comp. Sc. and Information Technology,
University of Malaya,
Kuala Lumpur, Malaysia.

Department of Business Studies²,
University College of Bahrain
Sar, Bahrain.

Tel: +603 79676432
Email: zab@um.edu.my

Tel: (203) 271-1319
rocky@termanini.com

Abstract:

With the advent of Internet technologies, governments all over the world are trying to provide efficient and effective service to its citizens. We see the implementation of e-governments with various flagship applications. In Malaysia, one of these flagship applications is e-health. In order to keep Malaysians healthy and fit, we need information systems that are accessible 24/7 with complete longitudinal health records. One such system is MIRTS, which maintains a repository of immunization records of all Malaysians.

In this paper we describe to the reader the concept of a central web-based repository that stores and maintains data of immunization record for Malaysian citizens and its residence. The paper starts with an introduction of e-health and its purpose. This is followed by a brief description of the Malaysian scenario with respect to immunization. The paper then focuses on MIRTS, its objectives and benefits to various parties. Next, we describe how the MIRTS repository will be constructed and finally we conclude with recommendations of how MIRTS can be implemented.

Keywords: e-Health, Web-Based Information System, Systems Integration and Data Warehouse

1.0 Introduction

E-government implementation is the trend which every stable government is moving towards. In the agenda, various flagship applications have been identified. Amongst these applications are; e-learning, cyber law, e-exchange, e-business, e-procurement and e-health. Health and wellness is a top priority agenda of every government and citizens of the world. *He who has health has hope; and he who has hope has everything* - Arabian Proverb. *When health is absent, wisdom cannot reveal itself, art cannot manifest, strength cannot fight, wealth becomes useless, and intelligence cannot be applied* - Herophilus. *The first wealth is health* - Ralph Waldo Emerson.

e-Health refers to all forms of electronic healthcare delivered over the Internet, ranging from informational, educational and commercial "products" to direct services offered by

professionals, non-professionals, businesses or consumers themselves. e-Health includes a wide variety of the clinical activities that have traditionally characterized telehealth, but delivered through the Internet. Simply stated, e-Health is making health care more efficient, while allowing patients and professionals to do the previously impossible.

While other industries have captured the value of the Internet early on, the scale and scope of the Malaysian healthcare system presents perhaps the greatest potential for Internet-based applications. Access, cost, quality, and portability have been concerns in the health care arena. Evidence suggests that both health consumers and doctors are frustrated with the maze of health care delivery. Fortunately, e-Health appears to be helping to resolve many of the challenges confronting the health care industry.

Looking at the practice of industrialized countries, just in the past few years, the following e-Health services have emerged:

1. Health portals, or health information sites, which empower consumers and physicians through customized education and online community experience;
2. Connectivity and communications solutions, which streamline administrative workflow, thereby reducing waste and inefficiencies; and,
3. E-commerce, including online health insurance and drug prescriptions.

As technology evolves, we could see even greater value-added Internet applications, including sophisticated chronic disease management tools. And as the market matures, a consolidation of all the online services will become likely. We could have a truly "Integrated Delivery System," with attendant quality, access, and low cost. The Internet could serve as a panacea to all of the complicated challenges confronting healthcare. Technology can ever displace the expertise and personal care that only healthcare practitioners can deliver but we believe that the Internet can go a long way in facilitating communication, streamlining administrative work that often takes away from time with patients, and educating both physicians and consumers.

In this paper, we discuss how Internet technologies and ICT can be deployed to look after the wellness of the citizens and residence of Malaysia as part of the e-health program.

2.0 The Problem Statement

It is not uncommon to meet citizens who only visit the hospitals and clinics when they are unwell. The general awareness of preventive medicine still needs to be campaigned, especially in developing countries. Statistics from the UNICEF state the fact that deaths are averted by immunization. The estimated number of deaths averted by immunization in 2003 was more than 2 million, as well as an additional 600,000 hepatitis-B-related deaths that would otherwise have occurred in the adulthood (from liver cirrhosis and cancer).

Immunization helps the body develop protection against a particular disease, so that if at a later stage the body comes in contact with that disease, it will be able to fight it off. A person needs immunization for each disease that he/she wants to develop protection against. Fortunately, childhood immunizations are free. Apart from polio vaccine which

is given orally, all immunizations are given through an injection in the upper arm, thigh or bottom. (Immunization - The Childcare Pages, 2006). If we look at the present challenges facing immunization, we find the following:

- There is no systematic nationwide immunization plan
- Immunization is getting more complex as new vaccines are developed.
- Hospitals have home-grown systems.
- Hospitals do not regularly share or transfer medical patient records.
- Physicians have no access to a child's complete immunization history...
- Scattered records, created by mobile citizens.
- Hospital do not use interoperability standards
- Most parents do not know immunization status of children.
- No Tracking system to remind parents

The solution is a web-based system, MIRTS, which is:

- A Centralized Repository
- Uses Standardized Healthcare Level 7 (HL7) interoperability protocol
- Managed by a trusted agency
- Able to save all records by time (longitudinal)
- Capable of simple data aggregation and Secure Delivery
- Ensuring smooth interoperability
- Facilitating streamline integration with other systems

3.0 The Malaysian Immunization Registry and Tracking System – MIRTS

MIRTS is a computerized registry of preschool-aged children and their immunization records. The purpose of the registry is to assure that children remain up-to-date with their immunizations and that their vaccination records are available when they are needed - when changing doctors and at the time of daycare/preschool and school entry. But more specifically, to allow the Ministry of Health to:

- manage better the Immunization data
- generate factual data on the progress of immunization in the country.
- forecast the wellness of children in the country.
- manage better its operations and optimize its cost.

MIRTS will be beneficial to both parents and children. Research has shown that both parents and physicians overestimate the rates at which children are fully immunized. Parents are often unaware of immunization schedule recommendations and physicians often overlook 1-2 vaccinations. This is becoming an increasing problem with the rapid changes in vaccination recommendations for children. MIRTS can:

- Give parents easy access to a permanent record of their children's shots even if they relocate or their children's' doctor retires.
- Let a doctor find their child's history in a computerized database if they forget the record or have difficulty obtaining it.

- Give parents the official reports needed of their children’s immunizations for daycare, school or camp.

The tangible benefits of MIRTS can be listed as follows:

- Better management of immunization records.
- Guaranteed privacy and Confidentiality
- Data Quality
- Encouraging hospitals to participate
- Extending the model to other areas of healthcare.
- Easier to integrate with other systems
- Electronically determining what immunizations are needed at each encounter,
- Providing calculations of actual coverage levels,
- producing immunization status reports for parents during child care visits,
- Automating the sending of reminder notices to parents,
- Bringing together fragmented records to produce one complete immunization history.

Information in MIRTS is kept confidential. Only a citizen, his/her doctor, or health care workers who can assist him/her with missed appointments or missed immunizations have access to MIRTS. The information will not be shared with any other people or any other agency. By calling the Ministry of Health and with proper identification parents can receive a free copy of their child’s immunization history at any time. Figure 1 and Figure 2 illustrate how all public and private hospitals are connected to the MIRTS database and accessible 24/7 through the Internet.

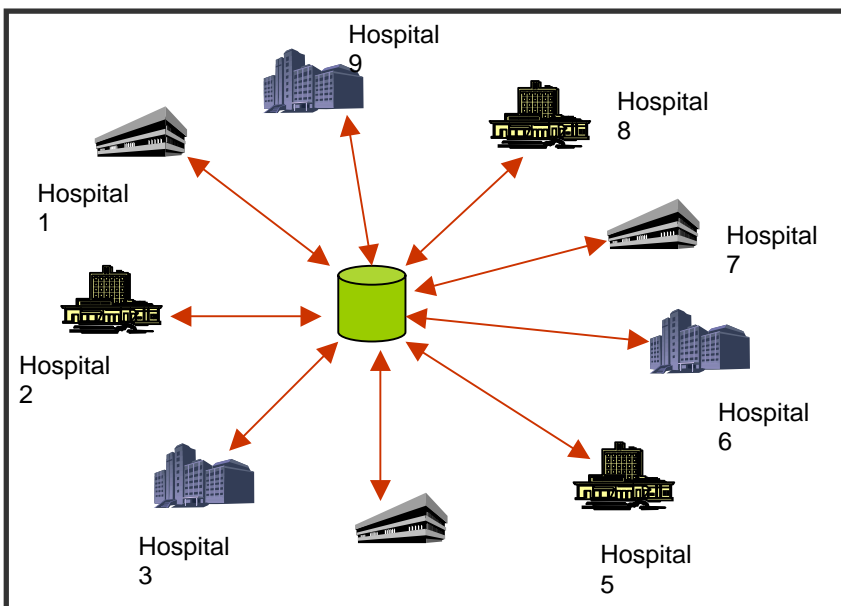


Figure 1: Hospitals Updating Immunization Records to MIRTS Database

Pediatric Practices that administer vaccines to children will be required to report to MIRTS. Each month, MIRTS sends a report to each pediatric practice asking for immunization histories on children who have turned 7 and 19 months of age. These are

two key times when immunization status should be reviewed. Similarly, a 2-year-old clean up report, known as the “Goldenrod” report is also sent each year as a last effort to try to bring a 2-year-old population up-to-date with their immunizations. Immunization coverage reports are generated for all Malaysian practices based on a child’s immunization status on their 2nd birthday. Up-to-date coverage is defined as 4 DTaP, 3 polio, 1 MMR on or after the first birthday, 3 hepatitis B (with the 3rd dose given after 24 weeks of age), Hib given age appropriately, and Varicella on or after the first birthday.

Sometimes children are up-to-date with their immunizations but were not up-to-date at the time they turned 2 years of age. MIRTS uses this age as a cut-off, as all children should be series complete by the time they turn 2 years of age. Another significant reason for a lower than expected rate is invalid doses. The most commonly administered invalid doses of vaccine are:

- MMR not given on or after 12 months of age
- Hib not on or after 12 months of age
- Hep B #3 not given on or after 6 months

Finally, a third reason can be attributed to lack of reminder and recall to the well-child visit. All too often it is found that the DTaP #4 and the IPV #3 are not given, suggesting that the older infant is not coming back to the office. MIRTS can provide parents with a more detailed explanation upon request.

MIRTS can help pediatric practices to obtain immunization histories on patients who transfer to their practice from any other pediatric facility in the country and have easy access to the first hepatitis B shot given in the birth hospital. For each pediatric practice the system is able to:

1. Print a list of children who are missing any vaccine at any time
2. Automatically generate recall notices to parents of those children who are behind and reminder notices for upcoming appointments
3. Print out official reports for children with all given immunizations documented
4. Determine immunization coverage levels for pediatric practice
5. Order vaccines and report doses administered electronically



Figure 2: Hospitals and Clinics Nationwide will be connected to MIRTS - Reaching the “trusted” Registry from Anywhere

4.0 Building MIRTS Repository

In this section we describe how the central Database or repository is constructed and how it will be populated with previous immunization records. This task consists of five steps and Figure 3-6 illustrates how each step is accomplished.

Step-1: Building the Registry

The Immunization Registry will follow the HL7 (Health Level 7, 2006) Reference Information Model (RIM), and the HL7 Meta-Model Framework. All interfaces with the registry are provided (free) by the HL7 organization, based on XML (XML, 2006). HL7 is also providing .net and Service Oriented Architecture documentation to help deploy the registry.

Step-2: Index all the immunization Records

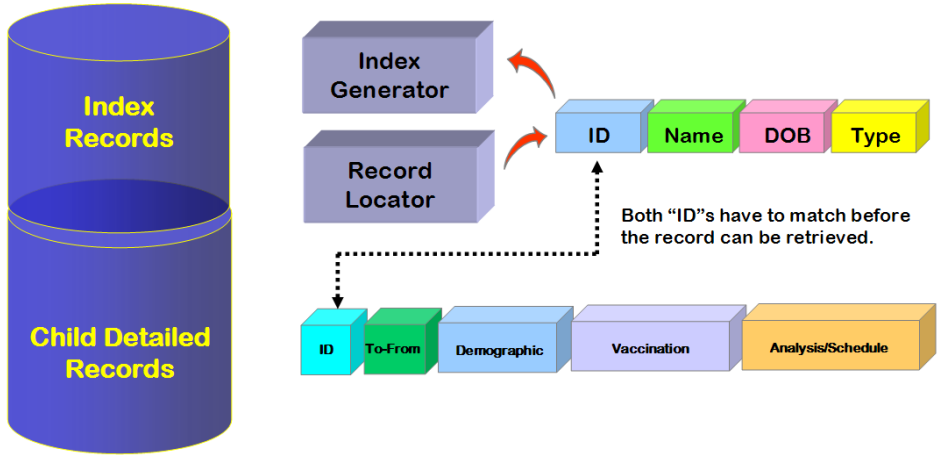


Figure 3: Indexing Immunization Records

Step-3: Link all records together and create The *Longitudinal* Vaccination Record

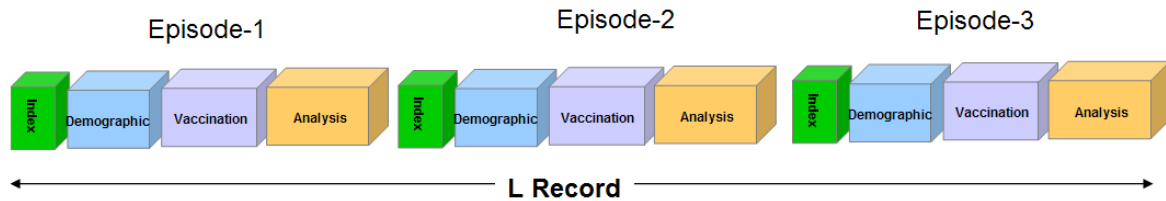


Figure 4: Building Longitudinal Immunization Records.

Step-4: Add future records to the *Longitudinal* Immunization Record:

New records (chains) will be added to Longitudinal records automatically. A count of the chains is also stored in the main HL7 registry.

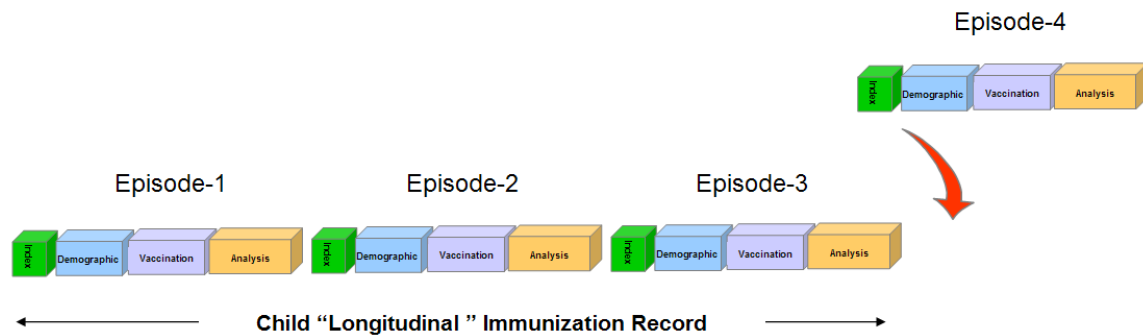


Figure 5: Updating Longitudinal Records

Step-5: Transform and transfer all current records to HL-7 compliant format and store in the registry.

It is not a surprise that the majority of medical records are paper-centric., or they are stored on a separate computer, or it can be part of the mainframe. The consolidation process may be tedious, but it must be done. Paper records have to be scanned as image, or retyped. Mainframe records have to be transferred to the new registry through a bridging system which will convert them to HL-7 format as well.

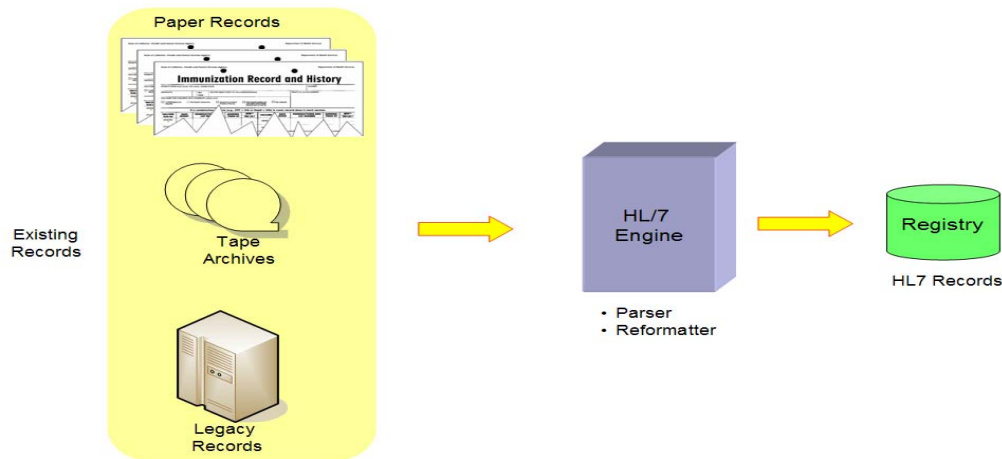


Figure 6: Transferring paper-based records to MIRTHS repository

4.0 Discussion and Conclusion

In this paper we have presented our proposed solutions to improve the efficiency and effectiveness of the immunization service provided by the government of Malaysia to its citizens. This can be achieved by building a repository of longitudinal immunization record of every child. Hospitals and immunization providers have access to this system via Internet. The real challenge for the success of this project is to get the commitment of all public and private hospitals and clinics to update immunization data to the repository. An even bigger challenge will be to transfer existing disparate paper based records to MIRTHS repository. The system's benefits, both tangible and non-tangible are immense and therefore worth every effort.

For a successful implementation of the system, we proposed the following approach;

- Get sponsorship for the development of the system. The most appropriate will be the Ministry of health.
- Carry out an Integration Awareness Campaign amongst hospitals and clinics to convince them and invite participation in this project.
- Approach Potential Technology Partners to implement the system
- Approach Medical Schools to encourage contribution from the medical aspect.
- Select 2 hospitals to participate in Project
- Conduct a Wellness survey
- Build Pilot to show benefits
- Help Ministry of Health to get hospitals and clinics on the registry.

We anticipate that the actual, programming and testing of the system, will not be as time consuming as getting the other human related aspects of the system. These include campaigning, user training and change management. Like any other huge IT projects, this proposal will also require a champion and the political willpower to be implemented and succeed.

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