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The Birth of I-Kelahiran – Sabah's experience

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Abstract

Though over the years, Sabah has recorded an increase of childbirth with better healthcare indicators, improving maternal and childcare has always been a major challenge. Therefore, with the aim of addressing the current issues of birthing discrepancy, delayed reporting of high risk pregnancy and maximum immunization coverage within the state of Sabah, "I-Kelahiran": Inovasi Kelahiran: was developed in June 2012. This computerised birthing system acts not only as an online storehouse of information, it also traces data and generates reports to reduce enormous duplication, save cost and time, as well as eliminating delays and confusion on management of health information. The system also helps to overcome the issue of collecting data from rural health personnel, particularly with the extreme geographical terrain in Sabah. This paper discusses how I-Kelahiran, a health information system was developed under the Sabah Health Department and shares its experiences in implementation. The experience and feedback from this system will help to build a full-fledged system capable of handling childbirth data at the higher level in Borneo.

Keywords: healthcare, maternal and childcare, health information system, Borneo

Abbreviations: Inovasi Kelahiran (I-Kelahiran)

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Introduction

Malaysia is a Southeast Asian country with thirteen states, consisting of two different geographical regions that are divided by the South China Sea. The rapidly growing economy has made a major impact, resulting in some commentators referring to it as the "Asian Dragon" with a total population of 28,401,00 and a Gross national income per capita of 16,530 Intl. US$ (World Bank, 2013). Healthcare in Malaysia has undergone some radical transformations. The earliest pre-colonial medical cases were confined mostly to those traditional remedies that are evident today in Chinese, Malay, Indian and other ethnic groups. However, with the birth of colonialism, more modern and westernized medical practices were slowly introduced to the country. The total expenditure on health per capita (Intl $, 2011): 616, and total expenditure on health as % of GDP (2011) is about 3.8% (World Health Organization, 2012a).

At present, Malaysia's healthcare system is divided into two sectors—the public sector and the private sector whereby the government places importance on the expansion and development of health care, putting 5% of the government social sector development budget into public

healthcare — an increase of more than 47% over the previous figure. This has meant an overall increase of more than RM 2 billion to improve in many areas including the refurbishment of existing hospitals, expansion of the number of polyclinics, and improvements in training and application of Information and Communication Technology (ICT) tools in the healthcare network (World Health Organization, 2013a).

Sabah, is the second largest state in Malaysia, is situated at the northern part of the island of Borneo, the third largest island in the world. It covers an area of 72,500 sq. kilometers with a coastline of 1,440 kilometers long washed by the South China Sea in the West, the Sulu Sea in the Northeast and the Celebes Sea in the East (See Figure 1).

Figure 1: Sabah, Malaysia (Source: http://www.malaysia-maps.com/sabah.htm)

Known to the world as "The land below the wind". Sabah is rich not only in natural beauty and resources, but also in the cultural heritage of its people. Sabah is also endowed with a heterogeneous population. The indigenous populations are made up of some 30 groups using more than 50 indigenous languages and not less than 80 dialects. The main ethnic groups are: the Dusun/Kadazan - the largest group who make up nearly one third of the population, the Murut, the Paitan and the Bajau (refer Figure 2). Other indigenous groups include the Bonggi, the Iranun, the Ida'an and the Brunei. In addition, the Chinese make up the main non-indigenous group.

Healthcare in Sabah

In relation to healthcare indicators, the mortality rate for children under five years of age in Sabah was 9.8 per 1,000 live births, or 525 deaths on 2010. This figure is still higher than the national average of 8.0 per 1,000 live births in 2008. On the other hand, Sabah recorded infant mortality rate of 8.8 per 1,000 live births on for 2010, equivalent to 471 infant deaths. This is, however, still higher than the national average of 6.2 per cent per 1,000 live births in 2008. In terms of maternal mortality rate, Sabah recorded 56 cases, or 104.4 per 100,000 live births for 2010. According to the national data, the reduction in maternal mortality rate has been progressing well from 44 maternal deaths per 100,000 live births in 1991 to 28.1 deaths in 2000 (JKN Sabah, 2010).

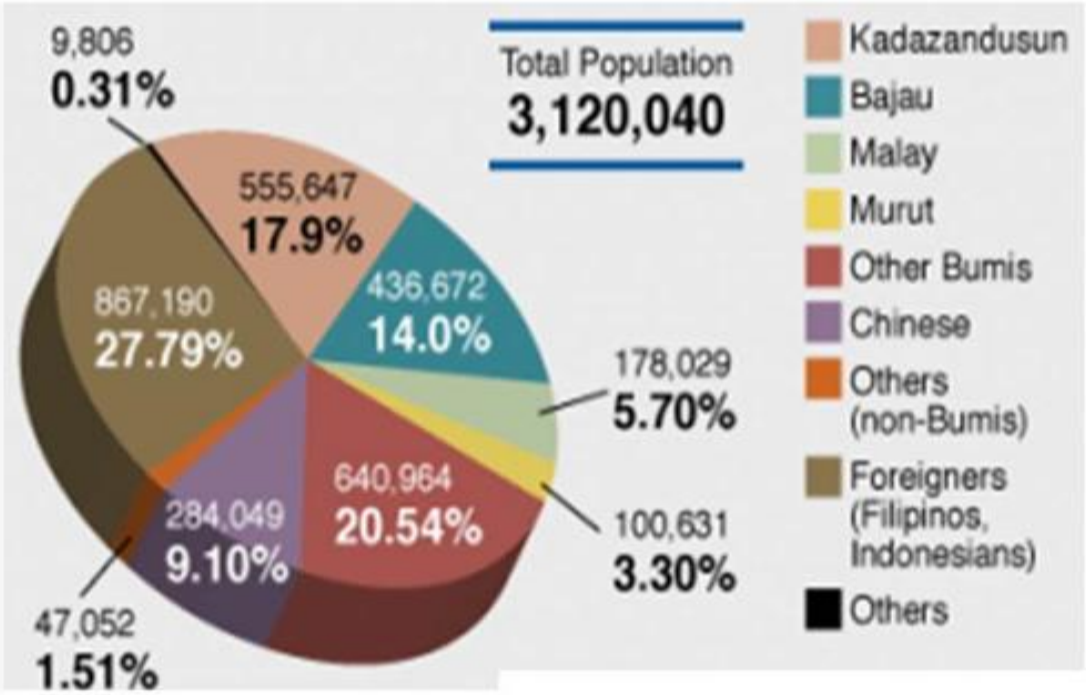

Figure 2: Population & Ethnicity in Sabah (Source: Department Of Statistic Malaysia, 2010-2012)

The Millennium Development Goals (MDGs) are eight international development goals that all 189 United Nations member states and at least 23 international organizations have agreed to achieve by the year 2015. MDG 4 & 5 respectively focuses to reduce child mortality by two-thirds, the under-five mortality rate between 1990 and 2015 and to improve maternal health by reducing three quarters, the maternal mortality ratio between 1990 and 2015. Improving maternal health care and to achieve 100% coverage of immunization, has always been a major challenge in view of achieving the Millennium Development Goal 4 & 5 (World Health Organization, 2013b).

According to the National Health Morbidity Survery 2 (NHMS II, 2006), 60% of Sabah's vast majority people are living in rural areas. The distance between health facilities is 7.2 km (Peninsula Malaysia, 5km) and distance between homes and health facilities is about 5.1 km (Peninsula Malaysia 2.5km) (NHMS II, 2006). Extreme Geographical terrain has always been a challenge for community health nurses to collect data and reports from hospitals and district health facilities. The non-citizens in Sabah accounts to 25% of the general population in Sabah. The high rate of transmigration of illegal immigrant has also been another challenge to the Sabah Health department (refer Figure 2).

National Birthing

National birthing report and post natal tracing are done by the public health division. Standard operating procedure (SOPs) of the Malaysia Ministry of Health requires that all pregnancies or deliveries have to be notified and reported to the public health division in respective states. The reports are handed over manually throughout Malaysia leaving the public health division to take

full responsibility on data collection from all the hospitals and private birthing centres. A designated nurse from each community health clinic is required to travel to government hospitals and private birthing centre to collect birthing data and also to trace high risk pregnancies, post natal home visits and immunization data. The information is then compiled at the end of the month to be submitted to the district health office and later to the state health department. This has always been a long tedious process for all nurses, matrons and district health officers, to validate all reports at the end of the month. Reports produced by the manual way seem to be impractical due to time and cost involved. Since this process itself takes half of the nurses' time to travel, collect and compile data, this has somehow reduces their time in the clinical work. The details on the methods and issues are presented in Figure 3 & 4.

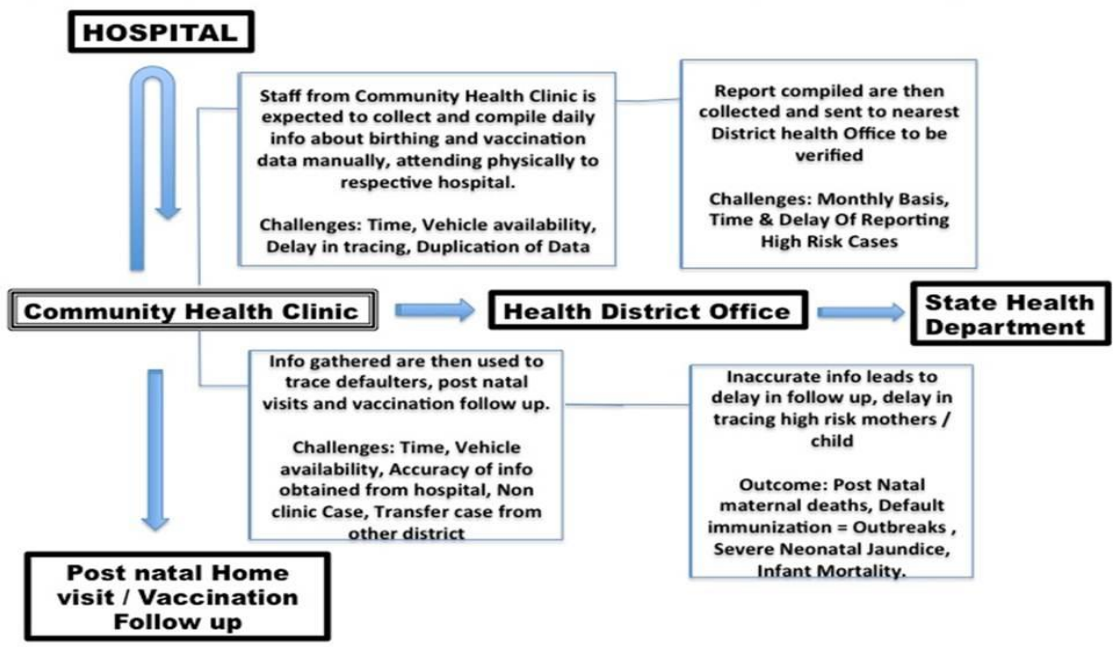

Figure 3: Conventional Method Of Reporting and Tracing Of Birth & Immunization Data

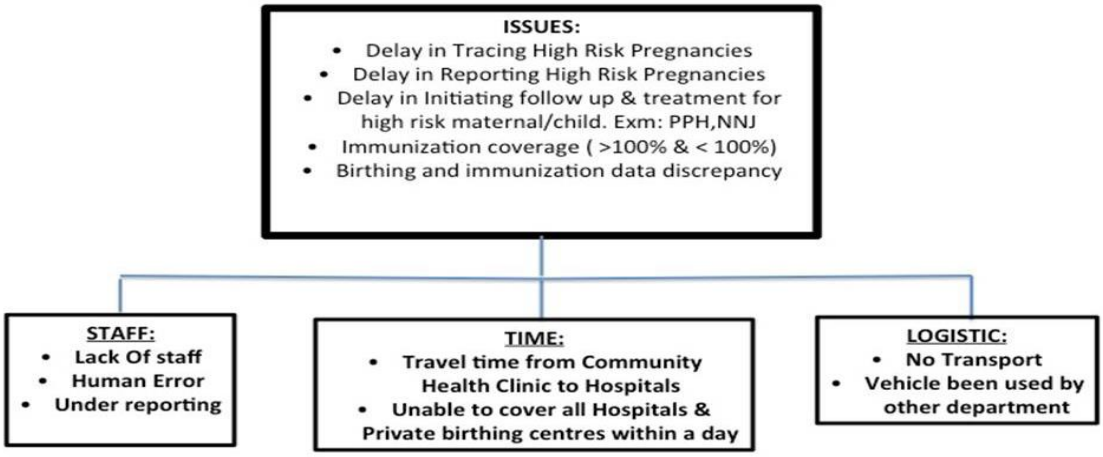

Figure 4: Factors Contributing To Service Issues In Sabah State Health Department

Furthermore, the existing State National Birthing statistic is compiled by various sources: 1) Health Management Integrated System (HMIS), which is based on place or origin of a mother. For example, if a mother is from Kota Kinabalu and decides to deliver in Sandakan, the delivery information captured should be returned to Kota Kinabalu as place of origin. However, in most cases, the data was found to be in both places; 2) TBIS (Tuberculosis Information System) - Birthing data which is captured from BCG immunization that are given to children. These data are extracted based on place of delivery (occurance), irrespective from where the mother lives; 3) Hospital delivery. All inward deliveries from the hospital services. These resources give three different figures which has always been a "haunting problem" in every state department of health in terms of gathering information on birth and vaccination coverage (refer to Table 1).

Table 1: Birthing Data As Reported By Different Sources 2011 (BPKK, JKN Sabah, 2011)

No	Resources	Birth
1.	TBIS	63,228
2.	HMIS * E-Reporting 2011	60,515
3.	Still Birth	59,949
4.	Registered birth (Department of Registration)	60,515

TBIS=Tuberculosis Information System, HMIS= Health Management Integrated System

I-Kelahiran

Information and Communications Technology (ICT) has been referred to as a 'key instrument' in healthcare delivery and public health internationally (Drury, 2005). When designed and implemented effectively, ICT can improve access for geographically isolated communities; provide support for healthcare workers; aid in data sharing; provide visual tools linking population and environmental information with disease outbreaks; and is an effective electronic means for data capture, storage, interpretation and management. In this context, ICT for health refers to any tool that facilitates the communication, processing or transmission of information by electronic means for the purpose of improving human health (Bukachi & Pakenham-Walsh, 2007). It has also been shown to be increasingly important in the education and professional practice of health care workers. The World health Organization (WHO) discusses the benefits of using ICT in the Primary Healthcare setting in terms of better access to information, improved communication between colleagues, facilitating continuing professional development and providing learning tools for healthcare professionals, patients and the community as a whole. (Rowe, 2008)

It is widely recognized that the role of ICT in the near future of healthcare will be significant and that healthcare professionals will need to be computer literate in order to function effectively in an increasingly digital environment (National Health Service, 1998). One estimate is that by 2010, 30% of a medical practitioners time will be spent using ICT (Skinner, Biscope, Poland, 2003), since it is thought to have the potential to transform healthcare delivery and improve the quality of care. Today, hundreds of healthcare information systems are used in hospitals and community clinics to serve numerous groups of healthcare professionals in their daily work with patients. In hospitals, healthcare information technology has already been shown to improve

quality by increasing adherence to guidelines, enhancing disease surveillance, and decreasing medication errors (Chaudhry, 2006).

During the past few years, the greatest achievement in health informatics under the health care system of Malaysia is the ability to monitor and control the emergence of communicable diseases, to respond in a more timely and effective manner (e-Notifikasi, e-Notis, MyTB) and also to enable remote areas in the country to gain clinical consultations via tele-medicine. This two great achievement has brought Malaysia to a different level of paradigm shift in health care services.

In June 2012, the Sabah State Health Department developed and subsequently implemented a new health informatics system called *I-Kelahiran: Inovasi Kelahiran*. This system was created to intervene the current issues of birthing discrepancy, delayed reporting of high risk pregnancy as well as the immunization coverage within the state. *I-Kelahiran* is a computerised birthing system which creates an online storehouse of information for tracing and reporting. It also reduces enormous duplication, saves cost and time, as well as eliminates delays and confusion associated with the collection or utilisation of health information that is scattered in health institutions, clinics and hospitals around Sabah. It is the hope of Sabah State Health Department that by introducing *I-Kelahiran* as a new health informatics system, it will evoke positive changes and produce effective solution in managing the current health care issues. What is remarkable is that there are no special extra inputs and financial implications to track every mother, child and delivery service since it is a web based programme with open source by providing a suitable online bridge. The signal can be sent to any remote place in a typical Sabah extreme geographical terrain with the help of Broadband/WAN.

The characteristic of the *I-Kelahiran* system are:

1. Storehouse of information on deliveries, high risk pregnancies and immunization
2. Information stored by a specific health centre/hospital can be automatically managed by the system to deliver the reports to another specific health centre or hospital
3. Special Pop Up Alerts to respective community clinics or district health office on high risk pregnancies, delayed post natal visit or due vaccination of a client
4. Captures, and detects client who transfers from one health clinic to another or to a different district in a state to deliver and inform the local health clinic of that particular district that a client not within their operational range is currently under their care (post-natal, vaccination)
5. Auto generated immunization online calculator of real time which estimates a districts vaccination achievement. This report can be auto-generated and exported to Microsoft Excel software for reporting purposes (TBIS 103)
6. Auto-generated birthing report (KIB 103)
7. Daily, weekly, monthly and selective reports can be printed as required and accordingly
8. Each step taken by individual staff involved in the processing of the data entry will be recorded in the verification information system for security purpose

9. Enhance the accuracy of data as data is input at a single point of entry at responsible center to avoid duplication and overriding of information.
10. The use of personal ID and password for each health personnel in the system tightens the control of the confidentiality of the data.
11. Electronic delivery documents for non-Malaysian can be created and printed under the syste, can be legally used to replace the manual sheet of documents.
12. Easy to search Menu: birth records of clients or baby in any facility in the state to prevent in the delay of post-natal visit and immunization follow up.

Technical Info On I-Kelahiran

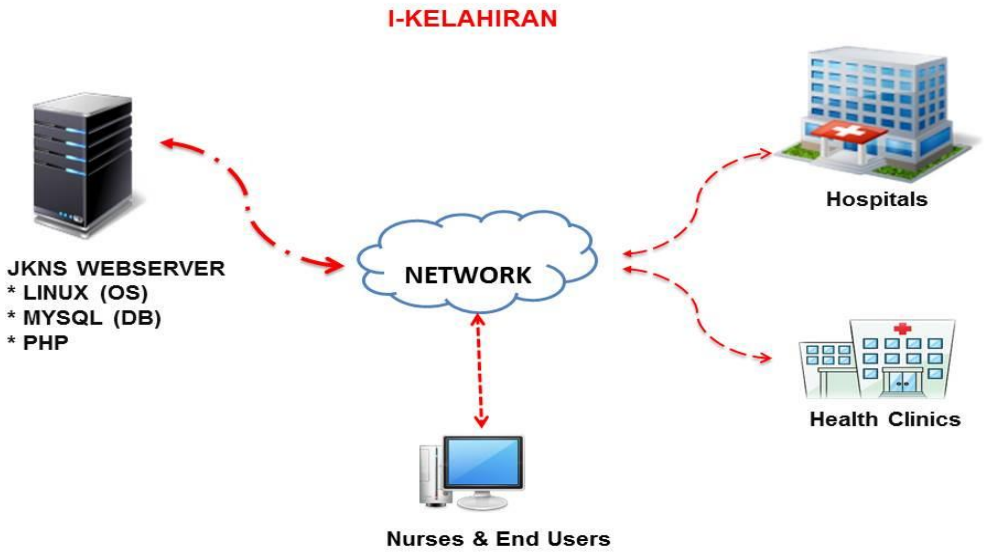

Figure 5: Technical Architecture Of the I-Kelahiran System

The software design, application and implementation (open source) was done by the author and the ICT unit of Hospital Likas and Sabah State Health Department.

Existing server host was used in order for it be accessed by users from all over Sabah. Web hosting by (PHP,MYSQL, and JAVASCRIPT) which can be accessed at: http://ikelahiran.jknsabah.gov.my. The system was built;

- PHP 5, MYSQL
- CSS JAVASCRIPT
- APACHE & AWS WEBSERVER FREE + PHP integrated
- Heidi 6 Mysql Administrator & Browser
- phpmyadmin

End users will be able to access with Web Browser ; IE7/IE8/FIREFOX/CHROME Browser which permits javascript and jquery, CSS minimum 1.0 and XML. Network access used:

MOHNET, 1GovNET, Streamyx, Broadband by various operators and even android and apple mobile devices.

The author and ICT team has design in such a way that end users can have various methods to access the system due to poor internet connection by local service providers in certain part of Malaysia.

Limitations

In order to make sure this system is successful, few important issues need to be addressed and overcome. These include the integration and sharing of data between hospitals and primary healthcare providers, and establishment of a proper work flow in disseminating institutional based data. Sharing data across multiple platforms within the health clinics and hospitals setting is a way to add value to the system since these data can be used as part of the information for better decision-making. However, data collected from different entities within the ministry is not routinely shared. Furthermore, the data gathered did not include those births from the private clinics and hospitals. Thus, the data might not be representative of the entire nation. In addition to that, issue of privacy and confidentiality is often being highlighted as this concern the sharing of individual health records and personal information. Therefore, it is important that such system should be handled with strong technological infrastructure that would protect the right of each patient.

Conclusion

I-Kelahiran was introduced with the hope to evoke more positive changes and instill more effective approach in improving current birth data management. With this new technology, it is hope that all enormous duplication and errors of manual reporting can be reduced and it further improves the productivity and job effectiveness of the nurses in tracing high risk pregnancies and immunization coverage in line with the Millennium Development Goals. There is still a lot of work to be done, nevertheless the spirit of the implementation team is high and optimistic. Currently, the plan to create and offline data base which automatically sends the required information to respective Hospitals and Health Clinics are in the process of planning.

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Competing Interests

No Competing Interests.

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