Developing a Medical Records System at the Ola During Children’s Hospital, Freetown, Sierra Leone

John DAWSON a,1, Matthew CLARK b and Liz PELOSO c

a School of Health Information Science, University of Victoria, Victoria, BC
b Honorary Research Fellow, University of Leicester Medical School
c Senior Lead, National Health Practice, Deloitte

Abstract. The development of a paper based medical record system and the corresponding database at the Ola During Children’s Hospital, Freetown, Sierra Leone, are described. This project took place within an extremely resource constrained setting, through the partnership of local and international collaborators. The key factors which governed the project were incremental progress and the intent to migrate the data to OpenMRS to ensure its sustainability.

Keywords. Database, developing countries, OpenMRS.

Introduction

Research into the cost-effectiveness of hospitals in the developing world is difficult. Hospitals that are grossly under-resourced often lack the administrative capacity to accurately collect and manage sufficient data. This is particularly so at the Ola During Children’s Hospital (ODCH), located in the densely populated and impoverished eastern part of Freetown, Sierra Leone. It is the country’s only specialized paediatric facility and serves more than 11,000 patients each year. The hospital’s chaotic medical records system fails to capture sufficient details about patients to provide continuity of care or to serve as a management or research tool.

Sierra Leone still has the highest child mortality rate in the world and has made little progress towards Millennium Development Goal number 4 (the reduction of child mortality by 75% by the year 2050) [1]. The international community has pledged tens of millions of dollars to improve the situation. Thus far the hospital has been largely overlooked by this international community, and unless it has a robust medical records system to evaluate both the efficacy and cost-effectiveness of donor investments, it will continue to be so. This paper describes the ongoing efforts in the development of such a system. As subsequent sections will illustrate, the hallmark of this effort is the

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1 Corresponding Author: John Dawson, 6969 Talbot Trail, R. R. # 1, Blenheim, ON, Canada, N0P 1A0, Canada; E-mail: johndawson@sympatico.ca.
planned migration from a simple but manageable interim solution to a more sophisticated and widely implemented open source medical records database. Equally important is the recognition that this goal can only be achieved through incremental progress that recognizes the site’s existing and evolving capacity to implement and maintain changes.

Although perhaps an extreme example, the situation in Sierra Leone is not unique. Thus although the intent is to provide a long term, sustainable solution for ODCH, ideally the lessons learned should apply to and be able to be leveraged by other countries facing similar challenges. To ensure our objectives of sustainability and transferrable lessons were attainable, we consulted with Health Metrics Network professionals already working in Sierra Leone on a number of health data management initiatives [2]. This early collaboration and planning advice allowed us to select solutions that would be both relevant and appropriate for the long term. An implementation strategy was developed that involved incremental steps (which themselves represented substantial progress) and that would easily transition to the data structures and architectures that were part of the long term vision.

The Need for Improved Paper Medical Records

The paper-based part of the electronic patient record system is crucial. A medical records system will only ever be as accurate as the clinicians who record the data. Therefore, when designing the system it was essential to have a large degree of input from local doctors. It is crucial that doctors understand why the system is important and feel a sense of shared ownership. Previously ODCH used blank exercise books, similar to those used by primary schools, to record patient information. The degree of detail recorded was largely determined by the individual clinician and varied widely.

A clinical forms package was developed that captures key information about the patient. The information includes basic demographics, social background, duration of symptoms, diagnosis, treatment and outcomes. These forms were intended to encourage medical staff to develop a rigorous clinical approach, standardize information and to facilitate data entry by medical records staff. It was developed and implemented by a physician (MC) while onsite at ODCH, in consultation with the hospital’s medical staff.

The forms package is based on that used by the paediatric emergency unit at Kenyatta National Hospital, Nairobi. It was refined after a number of consultations with the clinical staff at ODCH. Initially, it was tested for a one month period before undergoing further refinement in response to feedback from staff. Recently Dr. Tamra Abiodun, an experienced pediatrician and director of postgraduate training at ODCH, has further refined the forms to accommodate more up to date clinical practice. The first page of the package is completed by the nursing staff in triage and includes basic demographics and vital signs. The medical staff uses the remaining forms to record clinical findings, diagnoses and medications.
The major challenge in implementing the new forms package is engaging the non medical staff. The new package is more expensive to print and initially the hospital was reluctant to take on an extra expense. The ongoing challenge is to ensure that there is always an adequate supply of forms available when patients arrive. Again, due to the expense the hospital management are reluctant to leave a large supply of forms for use outside of office hours. Likewise, children who die very early in their admission do not always receive the correct paperwork. We are continuing to work with the hospital management team to improve the availability and use of the forms package.

The next step in improving the medical records department is to develop an electronic discharge summary that includes the unique patient number assigned by the database. This will ensure that when patients return to ODCH, information about their previous admission can be easily accessed and used to locate their medical records. (Most children in Freetown have their date of birth recorded as the first day of the month they were born. Therefore, date of birth and surname do not provide an adequate way to quickly identify a child returning to the hospital.)

Planned Migration to OpenMRS

From its inception the database developed at ODCH was and still is intended as an interim solution. The hospital’s long term goal is to implement OpenMRS, an open source medical record system. The use of OpenMRS has several advantages. It is a proven, widely implemented, and scalable enterprise level solution, supported by an established community of developers and implementers [3][4]. In the absence of any international standard for data structures, using the OpenMRS structure made the most sense and will allow a relatively straightforward migration of the data in the future. A second consideration is the fact that OpenMRS was created and refined by a fairly substantial group of experts in the area. The entire open source development process, with multiple resources for examining and incrementally improving the code, ensures that it is far superior to any homegrown solution we may have developed.

The choice of an interim platform was critical. Sierra Leone has limited capacity to create and support complex code or to deploy client/server database implementations. However, Microsoft Access™ is widely available and there exists sufficient capacity, even within the Ministry of Health and Sanitation, to support a solution in Access™. This was essential to improve local ownership, buy-in and capacity.

Database Design and Implementation

By Western standards a description of this database’s development is unremarkable, however it serves to illustrate the challenges encountered. As noted above, one simply cannot assume that the underlying processes essential for effective data capture and validation are in place.
The developer (JD) inherited the database which one of the authors (LP) had started during a visit to Sierra Leone to develop a national e-health strategy. Even at that early stage, the goal of transitioning to OpenMRS was evident: elements of the OpenMRS data model and partial conformity to its naming standards were in place. One of the initial tasks for the current developer was to implement role-based security to prevent the inadvertent modification of the database structure and data corruption. At this point development proceeded in the absence of a thorough systems analysis. The clinical forms package described above was not in place, although the health records department routinely received data from which monthly summary reports were prepared. The Microsoft Excel™ spreadsheets used to generate these reports were well constructed but very time-consuming to complete and presented scalability issues. Microsoft Access™ was chosen for application development because of its ready availability and the fact some ODCH staff were already familiar with it. The initial functionality of the database was limited to patient registration, patient-physician encounters and discharge diagnoses.

**Challenges**

Data entry continues to occur in the medical records department, after a patient has been discharged. This presents a problem in terms of missing data. For example, in the absence of a rudimentary paper admission-discharge-transfer system, medical records staff are often not informed of patient discharges, resulting in the inflation of statistical measures such as “days of care”. The fact that many patients’ actual dates of birth are unknown and cannot be reliably determined presented another challenge, requiring the inclusion of an “age estimated” database field.

The lack of a systematic paper system for clinical documentation is yet another example of a foundational component of healthcare application development which could not have simply been assumed to be in place. While onsite MC developed and implemented the forms package as described above, provided JD with information enabling continued development of the database, and was able to oversee its operation. Subsequent to MC’s return to England, a series of other Welbodi volunteers (the NGO involved in improving the health records and clinical processes) have been at ODCH to continue these efforts.

The need for efficient data management became even clearer when Sierra Leone’s Ministry of Health and Sanitation began providing free health care to pregnant and breast feeding women and children under age 5 in April, 2010 [5]. Previously parents were required to pay a consultation fee of Le15,000 ($3.50), making care unaffordable to many in a country where the average per capita income is $320 [6]. Following the introduction of free health care, the number of patients increased from 40-50 per day to 120-150 per day [7].

In spite of these limitations working as the single developer does have advantages. The database content can evolve in concert with the underlying paper medical record system, without overwhelming clinical or medical records staff. The developer can more readily respond to user requests than with large projects having multiple
development teams and more formal change management processes. For example, when a substantial change in the list of diagnostic codes occurred, consultation concerning how the new codes would be mapped to the existing codes was able to take place quickly, and previously entered data converted. It must be reiterated that without the planned migration to openMRS, the database would have been destined to become yet another “health data silo”, an unfortunate circumstance common in both developed and developing countries.

Next Steps

In future the database will be expanded to capture progressively more content from the clinical clerking package. Prior to each expansion, it is critical that the data integrity of the database’s existing state is assured through ongoing quality review. Data will continue to be used primarily in aggregate form for some time. This will assist the hospital in meeting its internal and external reporting requirements, and is especially important for maintaining and expanding funding.

Although integration of database output with real time clinical processes (either in paper or electronic form) will not occur for the foreseeable future, the data can be used to monitor the impact of a range of possible interventions. These range from small donations of equipment such as pulse oximeters or laboratory equipment, to much more expensive schemes such as improving staff remuneration and eliminating user fees. At a community level cluster trials could be used to investigate the impact of health education programs on accessing hospital care for sick children.

The accomplishments noted above have been achieved through the combined efforts of ODCH and resources provided by international collaborators. These resources have been effectively utilized through the onsite coordination provided by several team members from the Welbodi Partnership. In keeping with ODCH’s resource constrained environment, this project continues to rely heavily on the contributions of volunteers.

The sustainability of the database over the long term must involve a gradual transition from reliance on resources provided by developed countries to those which are expanded locally. In this regard, it is fortunate that a staff member within the health records department has had IT training. The developer will provide the additional training required for him to eventually assume responsibility for the database’s ongoing operation and development. In keeping with the theme of incremental progress, this training will initially involve an understanding the database structure, essential for subsequent query and report creation, and for maintenance tasks such as updating tables that support dropdown menus. The current developer will continue to provide consultation for issues which cannot be resolved locally and to ensure that the database continues to evolve in ways that are consistent with the goal of its eventual migration to OpenMRS.
Conclusions

Over the course of approximately one year and in the complete absence of any previous systematic clinical data collection methods, we have demonstrated that it is possible to establish a paper based medical record system, and to develop and implement a corresponding MS-Access database. The key descriptor of these achievements has and will continue to be **incremental progress**. Equally important is that this project has always been viewed as an interim solution. The planned migration of the ODCH database to OpenMRS is critical for its sustainability, ensuring that its data it will not remain isolated within the confines of a locally developed solution. Lastly, we have shown that through a partnership between local and international collaborators, projects such as this are indeed possible, even within an extremely resource constrained environment.

References


