Database/System Design of Healthy Beginning Program

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Acknowledgement and Endorsement

This report has been written by Badal Chandra Dhar and has not received any previous academic credit at this institution or any other.

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Acronyms

RDBMS- Relational Database Management System

HIAL – Health Information Access Layer

iEHR – interoperable Electronic Health Record

HB – Healthy Beginning

PHN- Public Health Nurse

CBDHA – Cape Breton District Health Authority

HCN- Health Record Number

CR- Client Registry

RCP- Reproductive Care Program

MSI - Medical Services Insurance

CDHA- Capital District Health Authority

IWK - Isaak Walton Killam Health Centre

EMR- Electronic Medical Record

PHIM- Primary Health Care information system

DHA- District Health Authority

NShIS – Nova Scotia Hospital Information System

HL7 – Health Level Seven

iPHIS- interoperable Public Health Information System

TCP/IP- Transport Control Protocol/ Internet Protocol

HTTP- Hyper Text Transfer Protocol

NSAPD- Nova Scotia Atlee Perinatal Database

GA- Gestation Age

API- Application Programming Interface

MDA- Model Driven Architecture

ASQ- Ages and Stages Questionnaire

Executive Summary

Healthy Beginning component is one of the two components of the Building Decision-support through Dynamic Workflow Systems for Health care project which is led by Dr. Wendy MacCaull, professor in the Department of Mathematics, Statistics and Computer Science of St. Francis Xavier University. This project aims to collect data on children to perform different assessment on children and provide support to the children and family.

A database system is in use which does not participate in decision making, and also do not store all the data that is collected by the PHNs. This project also aims to extract data on children, and women in prenatal and peri-natal phase from other databases around Nova Scotia.

To participate properly in decision making all the data collected by the forms/assessment tools should be entered in to database. To extract data, to have an interface to extract data, from other databases around Nova Scotia, it is important to know what are the systems and databases in Nova Scotia and how they are integrated. Existing database system has been studied, limitation has been identified and recommendation has been provided. It is suggested that this system should be converted to a proper relational database management system (RDBMS), MySQL. All data in the data collection forms should be entered, and scheduling and alert should be incorporated. Bar code reader system in entering identification, modification on forms to reduce data error and redundancy has been suggested.

To extract data from other sources, different information systems in Nova Scotia, like hospital information system, primary care information system has been studied. After all the study it is suggested that an interface that will connect the HB system with Health Information Access Layer (HIAL) if infoway will allow HB system to extract data from other systems/database.

Issues that need to be studied more; issues related to upgrade the existing system have been documented. However, discussion with decision makers and users requirement along with the recommendation suggested should be conducted to make the proposed system an efficient system.

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1. Introduction

1.1 Overview

This thirteen-week Summer Internship position with St. Francis Xavier university, Summer Intern position had the opportunity to work on creating an integrated well child system that links to a variety of provincial and regional data sources. The key activities were:

   I. Identifying technical needs for interface between identified databases

  II. Develop solutions to interface needs

 III. Interface testing

 IV. Other activities as assigned

  V. Public health focused: (Healthy Beginning program)

The revised directions by Dr. Wendy MacCaull finally had two objectives, one to upgrade the current tool (database) that is being used and another to identify information needs to plan for a interoperable interface that exchange data with other systems in Nova Scotia.

1.2 Introduction to the Organizations

The project where the intern worked is the Healthy Beginning (HB) component of Building Decision-support through Dynamic Workflow Systems for Health care project. The proponent of the project is St. Francis Xavier University (StFX) in Antigonish, Nova Scotia. The project is led by Dr. Wendy MacCaull, professor in the Department of Mathematics, Statistics and Computer Science.[1]

The collaborators in the design, implementation, and testing of the prototype workflow products are StFX, the Guysborough Antigonish Strait Health Authority, other Health Authorities in Nova Scotia, and an industry partner. [2]

The goals of Nova Scotia Healthy beginning program are to promote the optimal level of physical, cognitive, emotional and social development to enhance the capacity of the parent to support healthy child development. Target population of the program is 0 to school entry. In meeting the above goals one activity is to help Public Health Nurses (PHN)s complete screening assessment test, Parkyn Tool, NCAST assessment and setup a database that could assist in decision support related to these assessment process.[2]

HB program/system has long term vision to be integrated with the pan-Canadian Electronic Health Record (EHR).[3]

1.2 Limitations of the report

The objectives are related and based on the requirement and functionality in one objective, the other objective may require change the system's functionality. Moreover many issues like data requirement in future, integration issue with infoway, link with HIAL, cooperation from the current tool user etc, has created situations that are not definite at this point. These contingencies made the reports flexible and broad.

Reports in the appendices were developed according to different topics and deliverable timing. So, issues, concerns and suggestion repeated as the finding were late and sometime repetition occurred due to context.

1.3 Objective I: Current database and modification

1.3.1 Background

To support the activity of PHNs in Healthy Beginning Program activity a web-based database system has been developed and currently being used in CBDHA. The system stores only the total score collected for different assessment tools like Parkyn Tool score and NCAST score. The system has limited participation in decision making. The system is not storing all the data in the assessment tool (Form) that is administered by the PHNs. [2] The current system does not have an efficient scheduling and alert system that can support in decision making by PHNs. The database system has been developed in Lotus notes, and the client is in lotus notes too.

It was really necessary to know the current system in detail, its activity, and how this can be modified for better decision making and for increase in program efficiency. However, how the second objective, interoperable interface can be added to it to extract data from other sources was also an issue to consider.

1.3.2 Findings

The existing system is a web-based database, developed using Lotus Domino database (current version 7.0.3). The database is accessed using Lotus Notes Client (version 7.0.x). The unique identification of the records is a reference number, auto generated by the database system. Lotus Database provides limited referential integrity (RI), data exchange with other external database will have problem as this limited RI may cause trouble in identifying individuals uniquely. PHNs are keypunching partial data from the assessment tools and for the forms. There has not been any survey done on the accuracy of the data. Duplicate record of a woman is accepted by the database. Health Card Number (HCN) is entered into database but it is not used as a primary key as it is not always available on time of data entry. The database does not communicate or extract any data from any other systems for any purpose, neither does it use any Barcode printing and reading for identification field. The database system is not capacitated to provide a printout with scheduled activity of PHNs. As the database system stores partial data it can not also calculates the different assessment score. The forms/assessment tools contain

open fields those need to be coded. There are parts of the forms that require to be redesigned to reduce the data redundancy. Some forms contain mother part and newborn part in the same form, so there is a possibility of data redundancy in case of twin-birth. There had been changes in forms that added extra field in the data collection forms. This addition of the fields in database will cause missing values in previous records.

However, features of the current system have been summarized, limitation has been identified and documented, issues that need to be addressed to overcome those limitations and to make the system perform more efficiently have also been recommended. Finally how the existing system can be converted into a new/different system has been documented and discussed in detail in reports attached see appendices A, B, C, D, E, F and G.

All the findings have been summarized in three different objectives in mind.

a. All data should be entered so that data can be used in decision support, scheduling and alert.

b. Data redundancy, data accuracy, use of data in statistical research, better administrative support, better clinical support.

c. Future integration with other systems in Nova Scotia.

Based on the finding recommendations has be summarized. Due to lack of further information and cooperation actual conversion can not be initiated.

1.3.3 Summary recommendation/steps for current system upgrade

Lotus Domino database is not a perfect relational database management system (RDBMS) and as the HB database aims to participate in data exchange with other systems in Nova Scotia, there is a need for a new appropriate RDBMS. To participate efficiently in decision making all data collected in forms/assessment tools should be entered. As the current system is in use, the new database system should be developed separately. There should be discussion with different stakeholders of the existing system regarding the recommendation that have been suggested in appendices to be incorporated in new system.

As summary it can be said that new system should be built with all the functionality that the current one has. Free text field and other defined response in the

data collection form should be coded. Forms that contains both mother and child part data should be separated. Automation in case of ID management should be incorporated. A unique ID management should be explored in relation with CR of infoway. Different constraint checks both in database level and in front-end level should be explored and incorporated. User requirement should be studied, so that scheduling that will help PHNs to plan their activity, can be properly implemented.

Previous detail data entry should also be done before the new/ merged system is live. However detail discussion on this issue has been done in other reports. (See appendix G)

Detail recommendations have been provided in recommendation part.

1.4 Objective II: Interoperable interface for data exchange with other databases

1.4.1 Background

As the HB program aims to extract data from other database around Nova Scotia to identify women in prenatal, peri-natal phase, newborn and their data from Nova Scotia, an interoperable interface with other databases and systems around Nova Scotia is required. There has not been much explanation about the data requirement and data sources. Concept paper of HB has mentioned about RCP, Meditech, Nightingle and MSI as peri-natal and postpartum data sources around Nova Scotia.

To extract data it is important to know where the data lies, what database system of the targeted data source is and how communication can be done. These are related to both technical and administrative aspect.

Development of an interface to collect data from other system requires having agreement between the systems. Interface development also requires data to be identified that the systems want to exchange. For interoperable issue HL7 version being used by both the systems should be known and both systems should have interface to exchange message between them.

As there was not much work on these issues it was necessary to explore the database systems, communication system and how they are integrated at present and how

will they be integrated in future in Nova Scotia. At the same time the objective of this exploration was to identify the information flow within the systems so that it can be planned when and how HB system can participate in data exchange

1.4.2 Findings

There are different information systems in Nova Scotia. All the hospitals are not using a single system. Thirty four hospitals in Nova Scotia Hospital information System (NShIS) are using Meditech Client server system. [4] These hospitals are integrated but do not communicate with IWK hospital or Capital District Health Authority (CDHA). IWK is using Meditech Magic system and CDHA is using McKesson STAR.[5] Primary care hospital information system (PHIM) is also composed of different systems and only 32% have implemented EMR.[6] PHIM contains mainly two different systems of EMR one is provided by myNightingle and another by Practimax. There is no private Lab system in Nova Scotia. There are three Lab systems in Nova Scotia, DHA 1-8 with Meditich (CS), DHA 9, Cerner Lab and IWK Meditech (Magic) Lab. [7]

RCP, reproductive care program, maintains a database system in Oracle, but contains retrospective data. This database contains data on pregnant woman and newborn child. Part of this data, hospital discharge data, is basically extracted from the hospital records. This part of data, that is extracted from hospital and goes to RCP database, can also be extracted from hospitals. Currently RCP is not in the infoway infostructure but RCP is planning to be in infoway.

Infoway with its different project is planning and implementing the infostructure that will provide link and standard so that all the information system can communicate and participate in data exchange. At present Lab reports are automatically sent to clinics that are integrated with PHIM. [8]

IWK has its own identification number, hospitals have their own identification number, Client Registry of Infoway is going to manage this identification issue by keeping track of all the different identification numbers along with their own identification number, eCID.

Public Health Information System (iPHIS) is a web based system of Public Health Agency of Canada is not available in Nova Scotia, but is in place in other provinces. [9]

After researching the databases, information systems and infoway it has been found that instead of having multiple connections or interfaces to exchange data with different systems and databases around Nova Scotia, it is optimum to be connected with HIAL of infoway. This will allow the HB system to exchange data from other databases, as the infoway is developing an infrastructure that will connect the entire system in time.

However apart from being connected to HIAL, the options and features provided by the iEHR viewer should also be explored. Probably iEHR viewer will serve as Pull and Get data and it will not allow mechanism to extract and update anything to another system. HB needs to have required data to be updated into its system as an auto triggered update.

An interface can participate in data exchange in two different ways one is HL7 CDA based which is document centric, passive, and another is only message having no document which is auto triggered update.[10] Message that is auto triggered, non document based are of real-time fashion. As the HB system requires real-time fashion data exchange, so non-document based message that exchange data in real-time fashion would be a better choice for HB system to consider in developing interface.

Network Protocol and Services that will be supported in infoway are TCP/IP and HTTP. And TCP/IP will be utilized as the only transport for the iEHR integration Engine, Pos System, and iEHR repository. [11]

The findings in detail have been documented after researching numerous documents and information published in internet by different institutions regarding the variety of databases in use and information systems in Nova Scotia.

Following are the detail report about the findings mentioned above, related to the databases and information systems in Nova Scotia.

1. Systems- contains findings of different information systems around the Nova Scotia (Appendix H)

2. RCP- contains finding on RCP activity and database (NSAPD) (Appendix I)

3. RCPDisCussionWithIrene- contains further information on RCP after discussing with RCP people (Appendix J)

4. Infoway-contains information related to Infoway activity, when they are going to be completed, how they are going to connect different systems around Nova Scotia. (Appendix K)

5. HB How Architecture - this document contains discussion how HB system can be connected with Infoway and can have data from other systems. (Appendix L)

6. HL7 oriented interface development (Messaging/ tools)- this report discuss about the data exchange interface and also contains some interface development tool collected from internet. (Appendix M)

1.4.3 Summary recommendation/steps for interface system

In general it has been identified that a single interface to connect to the HIAL will allow the HB system to participate in data exchange with different systems and databases Nova Scotia in time.

Interface and HIAL should be explored more at different levels. Information flow according to infoway infostructure has been submitted in appendix (K), but detail of these transactions needs to be understood. Lab reports can be obtained from the Lab or can be obtained from the source from where the lab report has been ordered. And yet there are issues remain e.g. (i) data exchange standard version issue, (ii) mode of data exchange issue, and (iii) time of data availability, so these understanding will provide background information to identify points from where the data will be captured.

A single interface with HIAL will provide all available data from other sources to HB database. Development of such connection / interface requires more understanding of technology and management discussion with infoway.

However, discussion with infoway to be a part of HIAL should be initiated. What would be the port to communicate with HIAL, what would be version of HL7, what would be message translation procedure should be learned. These will also effect according to the data requirement of HB system. Different messaging strategy should be

required if HB requires to have document based message or non document based message.

Tools for developing interface should also be selected, and an in-house development of interface or vendor developed interface should be used to communicate should also be discussed with an expert who developed such an interface. HL7 communication and some tools have been identified and discussed in another report. (See appendix M)

Detail recommendations with steps have been discussed at the end of the recommendation. However, more and further understanding in both management perspective and technical perspective is important to proceed with this objective.

2. Lessons learned

Upgrading the existing database and interface development to extract data from other databases, both the objectives are related to each other so it was important to consider that development plan of both system is complementary to each objective. Along with the previous experience of the author, it was very useful to use the knowledge learned in Networking and the web, Health Informatics Systems and Issues, Health Information flow and standard and other courses.

In case of working on conversion of the existing system, knowledge taught in Health Information Systems and Issues and Networking and web course helped to understand the relationship of the tables, how they are organized, to investigate the existing database, what are the problems and how this can be overcome. It is very important to target the user acceptance and requirement of the decision makers along with the better functionality of the system. The recommendation and suggestion of an efficient system should be discussed and it has to be accepted by them otherwise it will be difficult to be accepted by the user. If decision makers are not convinced with the modification and suggestion then development and implementation of a computer system is difficult. Moreover, in case of existing system, change in management is also an important issue that requires support of the management. This concept was also reflected the idea of IT project management. The lack of cooperation by the existing system users is an example of these.

Dealing with objective two, plan the interface development, knowledge of all the above mentioned courses was extremely important, as the author had to learn what are the systems, how the information is flowing, how they are networked, what is the protocols they are using, how the systems are working, do they have an independent system or they share data among them, if they share data then how do they interface. In case of data exchange, are they using TCP/IP protocols to communicate with other systems, what are the standards they are using in communication etc. These combined knowledge helped to identify the current infrastructure and identify an optimum interface that can perform the required data communication with other systems in Nova Scotia.

Missing values, data cleaning, data accuracy, data redundancy are important issues in database, these issues were also addressed in the Health Informatics Systems and Issues and Statistics courses that added into the authors experience and helped the author to address the issues properly.

The database and systems around Nova Scotia has been studied and a proposed interface with infoway to connect other databases around has been identified. Issues related to future efficiency has also been identified and documented. This report suggests that apart from continuing the development of the new system, communication and discussion with decision makers and user should be initiated. If the users and decision makers are not involved then system development and implementation face difficulty.

Health Informatician supports the health system and care providers with their knowledge to perform their activity efficiently and to develop system to take better decision. They identify the optimal technical solution, incorporate all available tools knowledge available, and explain decision makers to accept the optimum solution. All these were addressed in this internship.

Other things that the author learned while researching the information systems in Nova Scotia is what are the different information systems in Nova Scotia, how they are connected and how they are going to be integrated through infoway.

3. On going activities
A computer technician, having prior concept on RDMS, has been trained on how to create table and database in MySQL from the data collection forms. Database is being

developed according to the data collection forms, which are being used to collect data for HB program. This system will allow all data to be entered from the form to the database. Detail data entry option is not there in the current system.

Mechanism should be incorporated according to suggestion provided and after discussion with HB decision makers, so that the system will alert and schedule according to the score and activity the data generates. However, development of the current detail data entry system should go through some revisions if the modification suggested related to the forms are considered and accepted by HB decision makers.

New system has been proposed and being developed using MySQL as back-end and PhP as front-end. Concept paper has mentioned about MDA architecture, object oriented database design. MySQL is one of the excellent RDBMS that has also been suggested by the previous industry partner.

Front-end has been suggested as PhP. It is possible to change the front-end at a later time, keeping the database intact, if other better functionality is to be incorporated. However, PhP is capable of generating scheduling, alerts requirements, logical, consistency and range check. PhP is also capable of incorporating component that can generate message in HL7 standard.

Database and the front-end should continue to be developed with whatever information is available, and changes would be incorporated whenever the required information is available. Delay in receiving information regarding form issue and processing steps may extend the development time and would cause repetition of work.

4. Conclusion

New system should be continued to be developed with existing tools (assessment tools and forms that are being used now) and identification mechanism the current system has. Discussion regarding changes on forms, identification, scheduling should be conducted and modification should be incorporated into the new database system.

Hospitals are using their own unique identification number, primary care facilities are using their own unique identification number, MSI has HCN number. HB system is also using an auto generated identification number. Infoway will mange all these

identification through Client Registry, It should be explored in both technical and administrative perspective how identification will be managed and how HB can have its Reference number as a part of Client Registry. This will solve the issue of unique identification number used by HB.

Several issues discussed in the reports (See appendices A, C, D, E, F and G) are uncertain and has little information to proceed with. Gathering further information and discussion with related people like HB decision makers or the Infoway people will clarify these uncertainties. Therefore, collecting further information and discussion should be initiated.

For example it can be mentioned that, to imitate the current system used in CBDHA, all its functionality has to be seen visually. Conditional data processing which is being done by the system apart from storing some vital information from the forms should be learned. Identifying the user requirement is important too because that will help care provider work efficiently with good scheduling system, and alert system. This requires discussion with the people working with this system. To find the best, shortest and efficient way to export the Lotus notes data, a copy of exported data is required. This requires consent and agreement of the HB decision makers too. To avoid data redundancy some modification in the forms are required. HB decision makers are to be explained about the benefit of these changes. Database development and front-end will have consequence based on these decision.

In general, conversion of a new system faces difficulty with user acceptance unless it provides the mechanism which existed earlier along with additional functionality, and unless it is discussed properly in detail with the users and stakeholders. Considering these points in mind, a good communication system has to be initiated with user and stakeholder of HB system at different phase of development.

However, the detail data entry of the forms will take more time than the current system is taking. There should be discussion on how this extended time can be managed otherwise the new system may not be accepted by the user or will be underutilized.

Assessment tools if they are being administered at home, outside the facility, a PDA based interface should be developed to interact with the system/ server and provide decision.

5. Recommendation

Apart from the current activity the following steps / recommendations are to be considered properly to make the HB proposed system run properly and efficiently. However, it would be better to conceptualize all the reports to realize the current situation it would help to proceed with the system properly.

For Database design/development

1. A new database system need to be developed with all the current functionality along with the capacity to accept all data that the assessment tools/ forms contains. Recommended functionality those have been suggested in different reports (See appendices A, C, D and E) e. g. (i). use of barcode printing of ID on sticker paper, (ii) data entry in ID part using barcode reader, (ii) separating the combined data collection forms for mother and new born should be incorporated in the new system. However, recommendations, suggestion should be discussed and matched with user requirement.

2. A user requirement study of the user of the system should be conducted, along with the proposed suggestion that have been made.

a. This will help understand the extra functionality that can be incorporated.

b. It will also identify the current operation of the system and what can be modified, that has not been detected yet.

2. Discussion regarding the issues of forms, identification and user requirement should be initiated with the HB decision makers and care providers. This has been

discussed in detail (see appendices A, C, D and E) However, but the major issues those needed to be addressed are:

       a. Management of different version of the data collection forms,

       b. Reduction of data redundancy by separating the mother part and new born part in data collection form.

       c. Identification issue (This also requires further discussion with infoway regarding the Clint Register (CR),

       d. Coding the free text field, coding the other field like Yes No

       e. Incorporate logical, consistency check

       f. Data validation with other data sources when there is a data exchange with other systems.

Such discussion will help in the following area in current system design.

i. Such discussion will help finalize the database design. Like if the forms can not be separated for mother and the baby, then how the repeated data collection on mother's data will be managed, when there is a twin birth.

ii. Such discussion will help taking decision regarding the coding (yes, no, missing values, and free text) and that will help finalize the database design.

ii. Discussion will also give understanding on perfect scheduling.

A good scheduling system will help PHNs to schedule their activity. This scheduling system will guide PHNs plan what to do when to do. Alert system will help the authorized person to know the required information without the intervention of any person.

Three types of scheduling have been suggested, Case based scheduling -This will be helpful to visualize the status of activity planned, completed, and what is due for an individual. Provider and date based (with link to all case and all events) scheduling - From this scheduling a provider can know what are the different events and individuals

that the provider needs to attend in a specific date or week. Provider and date based (with link to all case and specific event) – From this scheduling a provider can know what are the different individuals for a specific type of encounter that the provider needs to attend in a specific date or week.

This discussion will allow having access to current data that will help planning conversion of the existing system. This data set will help understand the accuracy rate of the data, how the parent child relationship is being maintained in database. This understanding will help in the steps of database conversion. Data conversion steps have been discussed in detail in appendices F and G.

Detail data entry will require extra time by PHNs to enter, so management needs to allow time to enter the detail data on the data collection forms.

4. Identification mechanism related with Client Registry of Infoway should be studied further and a decision should be taken after discussion with different stakeholders whether it is possible to have the Reference number of HB in CR. However, if it takes time to decide, current Reference number use as a unique identification should be continued. HCN number should also be used as unique identification instead of Primary key.

a. This understanding will give idea if current unique identification, Reference number, can be maintained with interoperability opportunity in future or not.

b. This will also give idea if any other alternative unique identification system should be incorporated or not.

5. Currently, only part of the collected data is entered. There are previous forms, detail data of those forms has not been entered. So this detail data entry on the previous forms should be resolved and decision on, whether or not they will be entered now, has to be taken. Detail data entry of the previous forms will cause change in the database conversion steps (See Appendix G). This activity will require time and effort too. This has to be discussed and decision on this has to be taken too.

6. When the new system will be operational and tested with full functionality then the existing system should be converted, all data should be exported / entered to the new system. The conversion process/ migration process of the existing system, conceptually, has been documented and submitted in appendix F. Appendix G discusses the related consequence of previous detail data entry issue in case of existing database conversion steps.

Issues like unique identification, range check, logical consistency check, scheduling, alerts; issues related to form, accuracy issue have also been discussed in separate reports and attached in appendix. These issues are related to new system and related to expansion in future when there will integration with other system. These are in the following reports:

1. Possible steps to consider for future of HB system. (Appendix D)
2. Area to be studied for further information for HB system. (Appendix E)
3. Issues and concern related to current tools in CBDHA and future system. (Appendix A)
4. Forms (Appendix C)

7. The new system should incorporate all the mechanism that the current system has, should have the same interface the way it has now, modification should be adopted, and should continue to be developed. Changes in current mechanism / interface may reduce user's acceptability.

Interface development

8. Discussion with Infoway should be initiated to know the administrative and technical requirement to be a part of HIAL. If HB system can not have agreement with infoway then data exchange will not be possible. Then isolated separate interface individually to all identified databases would be required, which would be difficult to

manage. This discussion will provide understanding of the technical specification of development of interface and other administrative requirement.

9. Further detail knowledge on topics like iEHR viewer, HIAL, CR should be learned. This will help to know how communication can be initiated to participate in data exchange. This will also help HB system to decide whether Reference number of HB system can be maintained as unique identification or not. In addition this understanding would also help how HCN number can be authenticated from other data source and date of birth and other information can be extracted from other validated data source.

10. Tool selection for developing interface should be studied and expert opinion should be sought for developing interface. This has been discussed in detail in appendix M.

11. Identification of data requirement. Possible data requirement should be identified in two perspectives.

    a. For collection of data

As for example date of birth, GA (gestation age at birth) can be collected from hospital through the data exchange interface. Such data extraction will reduce redundancy in data collection.

    b. For validation purpose

    HCN, mother's date of birth can be extracted from MSI or from Client Registry of infoway for authentication and validation.

After generation of data, it will travel into different other places as message, so it should be identified which would be the best source to extract that data. For example, it can be said that, Lab data can be extracted from PHIM or from Lab, Lab report is generated in Lab and will travel to PHIM.

Data collected by RCP has been discussed in other reports (See appendices I and J). Some other sources of data that have been identified are IWK new born testing, Hearing and speech clinic and ASQ forms. Some of these are computerized while others are not. These data sources have been described in another report (See appendix A). Different information systems and their interaction have also been described in another report (See appendix H). Infoway infostructure describes how the systems are connected. This has been described in another report (See Appendix K). According to sources and connectivity data requirement has to be identified that will help design interface.

12. After identifying the data requirement, data collection mode, whether the data is required in real-time fashion or not, should be decided. It has to be identified if the messages going to include document or not. HL7 specification of the destination data source should also be understood.

13. Interface development and test.

There are GUI tools available, like EasyHL7 Products, 7Edits, there are Application Programming Interfaces (API) available like HAPI, both can be used to develop interface. There are software firms who develop interfaces but in-house development would be a good choice as it will be easy the change according to requirement. Finding regarding the HL7 message, interface development tools available are provided in another report. (See appendix M).

14. Other periodical activity

While the database and system are running there should be some periodical check on the database. These are as follows:

1. Periodical data accuracy check

2. Whenever possible data from validated source should be extracted

3. User satisfaction should be studied and modification should be incorporated

4. Changes in work flow should be identified and modification should be incorporated.

In summary it can be said that upgrading the existing system and interoperable interface needs further discussion and collaboration to develop a better system. This effort should identify the actual need for client and should help develop an appropriate system.

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Appendix A: Issues and concern related to current tools in CBDHA and future system

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Appendix B: Data entry system in CBDHA, Discussion with Anne Mackenzie

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Appendix C: Finding on current forms and discussion

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Appendix D: Steps to consider for future of HB system (with priority)

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Appendix E: Area to be studied for further information for HB system

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Appendix F: Steps to convert CBDHA database

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Appendix G: Data Conversion addition

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Appendix H: Different systems in Nova Scotia,

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Appendix I: RCP, NSAPD

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Appendix J: RCP more information

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Appendix K: Infoway

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Appendix L: HB system with in other systems in Nova Scotia

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Appendix M: HL7 Message, interface, and Tools

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Appendix N: Midterm internship report

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Appendix O: Weekly reports

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Signed copy submitted in hardcopy

Declaration

Badal Chandra Dhar Sharma the undersigned, hereby declare that the work contained in this report is my own original work and has not previously in its entirety or in part been submitted at any university for a degree. All above work is satisfactory to Dr. Wendy MacCaull - internship supervisor and meets all requirements for internship for Master of Health Informatics program at Dalhousie University, Halifax, Nova Scotia.

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