Data Flow Diagram Project For Perinatal Follow Up Program

at IWK Health Center

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Endorsement

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

Hanan Mohsen Alyafei

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1. Executive Summary

The author wrote this internship report to provide and describe, in detail, her duties to successfully achieve the data flow diagram project. This internship project was conducted from May 2 to July 29 2016 for the perinatal follow up program at IWK Health Centre, Halifax, Canada.

The internship opportunity provided the author on-the-job training, which linked the academic health informatics knowledge with real world healthcare as IWK Health Center. The internship's experiences comprised of a variety of responsibilities and multitasking abilities, which made it a valuable learning experience for the author. Moreover, it was a great chance to learn how to bridge the information-communication gap between the PFUP director and the PFUP team members, and to map an accurate data flow diagram that reflects a real world scenario at PFUP. The PFUP is a very busy environment dealing with complex patient health conditions, such as extremely high-risk, very high-risk, and high-risk. The author dealt with various challenges to find suitable methods to visualize the PFUP complex processes by data flow diagram. At the end of the internship the author made a presentation for the PFUP team members to explain the project work and the final product was delivered to the director of PFUP as context, Level -0, and level –1 data flow diagrams.

2. Introduction

The Canadian Neonatal Follow-Up Network (CNFUN) is a collaborative multidisciplinary team from Neonatal and Perinatal Follow-Up Programs from different

hospitals and universities across the country. CNFUN aims to develop a standardized set of assessments for high-risk infants to create a national database (The Canadian Neonatal Follow-Up Network, 2009). Among Nova Scotia and Prince Edward Island, the Perinatal Follow Up Program (PFUP) at the IWK Health Center provides the healthcare service for most the eligible high-risk infants for the program. Moreover, PFUP at IWK Health Center is collecting the patients' development assessment information and saving it in the PFUP Database. Only infants who are born at less than 29 weeks have their development assessment information stored at CNFUN Database.

3. Organization Description

The IWK Health Center Website Homepage is very useful for the author to gain a lot of information about this organization history. In 1909, the children's hospital in Halifax provided the healthcare for newborns, children, youth and women. Izaak Walton Killam (IWK) Hospital opened in 1970 as a healthcare provider that provides high quality medical care for women, children, and youth in the Maritimes. The IWK Health Center and Grace Maternity Hospital merged in 1996. Finally, in 2000, the name of the hospital was shortened to the IWK Health Center. The IWK Health Center has variety of medical care: Primary Care, which is available for the patient by a direct access; Secondary Care, which is required a referred from a family doctor; and Tertiary Care, which is the highly specialized and complex medical care which is involved the advance procedures or treatments. In a recent report indicated that between April 2014 and March 2015, the IWK Health Centre has more than 3600 employees and 928 volunteers providing health care to its patients (IWK Health Center, 2016).

4. Perinatal Follow Up Program Description

The PFUP enrolls the high risk infants with health problems who meet certain criteria such as born < 31 weeks gestation, < 1500 grams or less, and born with, or suspected to have brain injury at birth. In addition, infants with some risk markers; such as meningitis and cerebral imaging abnormalities of hemorrhage or infarction will be accepted (Vincer, 2011). PFUP provides developmental assessments for the enrolled infants and support the infant's family members by adequate health education materials, medical treatments, or services to fulfill their developmental potential (Family and Newborn Unit, 2015). The multidisciplinary team works in the PFUP to provide comprehensive sequential neurodevelopmental assessments for the high-risk infants during their first 3 years of life. The multidisciplinary team includes physicians, registered nurses, physical and occupational therapists, nutritionists, and more healthcare professionals who work together to assess the registered infants' health conditions. The multidisciplinary team will evaluate the infants' health condition to determine the suitable follow-up plan as Extremely High Risk, Very High Risk, or High Risk patient's plan (Vincer, 2011). The assessment clinic will be held ether at IWK Hospital Center or as a Travel Clinic depending on the enrolled patient's location. The Travel Clinic includes Queen Elizabeth Hospital at Prince Edward Island, Cape Breton Regional Hospital at Sydney, and Moncton Hospital at New Brunswick. During each assessment clinic, the multidisciplinary team members collect all patients' information in forms then they write the assessment reports that are saved in a paper-based chart after each visit. The assigned physicians will review the patient's chart and evaluate all the multidisciplinary team reports, and then they will dictate the final reports. The medical assistant will transcribe

the dictated reports and save it in the paper chart. The director of the PFUP will select some of the required patients information from different sources to enter the information to the PFUP Database. These sources are the PFUP paper-base patient chart and several Health Records from different hospitals either 'Meditech' electronic systems or paper based records.

5. The data flow diagram project scope:

This internship project is aimed to visualize the current PFUP processes. The author attended the development assessment clinics, rounds clinics, and meetings with the PFUP team members, clinical leaders, and director to capture all the possible tasks and processes that are conducted within the PFUP. The author used the Microsoft Visio software to complete the PFUP data flow diagram project.

6. Internship Work Description

The internship report section will outline and describe the author's roles, tasks and responsibilities to complete the internship project at IWK.

6.1 The Author's Main Tasks

The author's tasks started at the 1st and 2nd week by attending the development assessment clinics, meeting with multidisciplinary team members, and meeting the director of the PFUP. The author collected the information about the PFUP and the existing system initial workflow from the official website, and the materials that were provided in the PFUP clinic during these two weeks. This step is very important to help

the author to gain a full understanding about the medical services that are provided in the PFUP. Additionally, the author's roles, during the internship period, included:

1. Attended the development assessment clinics
2. Analyzed the existing PFUP system and workflow
3. Performed literature review to identify the PFUP problems and the evidence to find best solution
4. Proposed two different ideas for the internship project for the PFUP director:
    a. Implement an electronic survey to measure parental satisfaction with quality of care in PFUP
    b. Create data flow diagram for the PFUP as Business Process Reengineering project
5. Met the PFUP director and team member to choose the needed and more suitable solution to work on it during the internship period
6. Met the Dalhousie supervisor to confirm the project idea, which PFUP director chose
7. Planned the business process-reengineering project timeline
8. Observed the details of the development assessment clinics workflow
9. Observed the PFUP team members office workflow
10. Used Data Flow Diagram techniques for the Business Process Reengineering project
11. Used Microsoft Office Visio as Business Process Reengineering tool
12. Create Context Diagram for the PFUP
13. Create Level - 0 Diagram for the PFUP

14. Create Level - 1 Diagram for each complex process in Level - 0 Diagram
15. Met PFUP clinic leader each week to review and confirm the finished work in the Data Flow Diagram
16. Met PFUP director every 2 or 3 weeks to review and confirm the finished work in the Data Flow Diagram
17. Met the Dalhousie supervisor each moth to review and confirm the finished work
18. Presented the Data Flow Diagram project presentation to the PFUP team members at the end of the internship period

7. The PFUP Challenges and Problems Description

A literature review was conducted to identify the problems and challenges that PFUP is facing during its long, and complex processes of patents' assessments by using research databases through Dalhousie University libraries and PubMed. The main challenges in PFUP processes appear while the multidisciplinary team members were collecting the patient assessment information in a paper-based chart, and selecting some of the patient data from several 'Meditech' systems to save it into the two different databases (PFUP database and CNFUN Database). The multidisciplinary team assesses the patients and collects the data by the paper-based forms in their charts. Majority of the paper-based charts have several disadvantages such as illegible handwriting, inadequate information, redundancy of patient information, overflowing patient information in between sections, incomplete documentation, and accessibility problems when the chart is used by one team member during the development assessment visit (Roukema et al., 2006). These problems also appear in the Electronic Health Records 'Meditech' that includes some

PDF medical documents that were scanned and saved in the patient electronic health records (Steurbaut et al., 2013). The PDF documents may include medical reports, test requests, test results, and signed consents for different medical procedures that are saved in patients' electronic health records in one category. Unfortunately, these PDF documents are not organized alphabetically, or by date, which makes searching for patient's information very hard and time consuming. In addition, these challenges are increasing the amount of time assigned physicians and administrative assistants use to review the patient chart, and several 'Meditech' systems to dictate and generate the final PFUP development assessment report that is to be transcribed after each patient assessment visit. The dictation step is a complex step, which requires more effort from the physicians to gather patient information from different reports and sources, such as the PFUP chart, or several electronic health records from different hospitals. This step may increase the human error while collecting information from the handwriting document information to be dictated and to be transcribed (Bowman, 2013). In addition, the transcript step causes a lot of delay to finalize each patient report and add it to the patient chart. The assigned physician and the PFUP database manager do the final step by selecting the needed information from the final development assessment reports, and other patient health records as a chart or 'Meditech' systems, then save it in both databases. This step is done by assigned nurse who entering the information manually to the databases. This step requires a great deal of time and more effort to be completed and updated to the databases for all PFUP enrolled patients.

8. The PFUP Data Flow Diagram Project Description

This internship report section describes the Business Process Reengineering (BPR) method, theories, and the importance of PFUP data flow diagram project. The HINF 6110 course, Health Information Systems and Issues, was the main source of knowledge that the author applied in this project.

8.1 Business Process Reengineering

Business process reengineering (BPR) was defined as 'the fundamental rethinking and redesign of business processes to achieve dramatic improvements in critical contemporary measures of performance such as cost, quality, service, and speed' (Bliemel & Hassanein, 2004). The BPR project will be dependent on the business process modeling that describes the PFUP data flow in a simple way to be useful for the PFUP users, team members and the internship student. BPM is defined as 'a set of related tasks performed to achieve a defined business outcome' (Wenhong & Alex, 1999, para. 6). Business process modeling has main three elements - entities, objectives, and activities. BPM helps to share the understanding of the process among health professionals, and support the analysis of process behavior and performance. BPM supports designing new processes for the existing system to continue its improvement, and providing a software program to control processes in the future when needed (Wenhong & Alex, 1999). This software has several business objectives, to ensure the delivery of high quality systems, provide strong management controls, and maximize productivity.

During the internship period, the analysis phase was done with consistent development between the context, Level-0, and Level-1 diagrams to produce the data flow diagram as

a process model of a system. The author used the standard set of Gane and Sarson symbols, which contains four symbols: processes, data flows, data stores, and external entities to accomplish the PFUP data flow diagram project (Hoffer, George, & Valacich, 2011). The data flow diagram tool helps the author as a system analyst, and the users to describe the information data flow among the performed activities, and where the development assessment information is saved as main data storage in the PFUP (Jun, Ward, Morris, & Clarkson, 2009).

8.2 Theories

The author traced back the BPR project to both Management Theory and Information and Communication Theory. The author used business process reengineering knowledge and the data flow diagram as an important communication technique and tool among system analyst, end users, and system programmers.

8.2.1 The Management Theory

In 1880, Frederick Taylor indicated that process-reengineering methods would help the manager to determine the best processes to perform the work and enhance productivity. This theory supports the PFUP needed to reduce time consuming challenges as well as effort. The PFUP data flow diagram will help the PFUP director to identify these processes that cause problems and redesign the processes to be more productivity (Chen, 2001).

8.2.2 Information and Communication Theory

In 1940, Norbert Weiner theory supports a framework that is summarized in the component of all information communication system: ‘ the information source, the

transmitter, the channel, the receiver, and the destination' (Tan, 2001). This theory supports the PFUP needed to improve the communication between the manager, users and data analyst. Better communication will improve the performance within the PFUP. Moreover, the PFUP director future plan is to have a PFUP electronic system that collects the patient development assessment data instead the PFUP paper chart. This future plan is required for better communication between the IT developer, users, and managers. Also required, is an accurate data flow diagram, which will help the IT developer system to understand the PFUP environment to easily develop a system that will accomplish the PFUP needs.

8.3 The Importance of the PFUP data flow diagram Project

The author highly recommends the data flow diagram for the PFUP director. The author notices that the PFUP did not have any type of diagram to describe the PFUP workflow. The data flow diagram provides a clear and simple workflow description to be understood. The data flow diagram has essential role in designing a complex information system. Also, it is important to be used to computer aided information system development. The data flow diagram has a main goal that bridge the existing communication gap between the information system developers, users, and managers by a simple diagram that contains very understandable symbols for the team members and users (Jankowski & Lloyd, 1998).

Data flow diagram project is an important graphical representation of the data flow for each clinical unit and its processes. Data flow diagram has many benefits as demonstrating the patient data flow for staff easily, as well as demonstrating the

weakness in the workflow processes for managers. This will highlight the cause of problems in the current environment. As a result, several solutions will be created to improve the data flow for the clinical service to approach future needs. A data analyst will visualize and compare both the current dataflow and the suggested solution dataflow for PFUP to find more productive solutions and new opportunities to improve the healthcare service in the PFUP (Keel & Jennings, 2016).

9. The PFUP Data Flow Diagram Description

This internship report section describes the final sets of PFUP data flow diagrams, which are context, Level – 0, and Level - 1 diagrams.

9.1 Context Diagram

The context diagram is a simple representation of the entire PFUP system. This diagram illustrates the interaction between external entities (eligible patients, family members, PFUP database, CNFUN database) and the PFUP system boundary under a special construction or process. This single process is labeled ‘0’ that presents the entire system (PFUP) (see Appendix A for more information about the PFUP context diagram). This diagram is known as a highest-level diagram, which will give an overview of the input and the output information for the PFUP system. Appendix 1 illustrate the external entities, which are:

1. Eligible patient for PFUP from different hospitals and their family members as input information to the PFUP system
2. PFUP database as input information to, and output information from the PFUP system

3. CNFUN database as second output information from the PFUP system

9.2 Level – 0 Diagram

In Level – 0 the author constructed the diagram to develop further a model. The author described the main PFUP development assessment processes by identifying all main sub systems in the PFUP system. In this diagram the full illustration for the main processes, the data stores, and data flow between these process are identify clearly (see Appendix B for more information about the PFUP Level - 0). The Level -0 diagram required a lot of effort from the author, the PFUP clinical leader, and director to finalize it as it is appeared in Appendix B.

9.3 Level – 1 Diagram

The author identified all complex processes in Level – 0 diagram that need to be decomposed. The Level – 1 diagram illustrates the decomposition processes as clear logic data flow, from the input data to output data. The decomposition level as Level-1 shows that each process has one input and one output data flow. This diagram illustrates a very simple and clear description for the data flow processes that perform a very complex process in Level - 0 (see Appendix C for more information on the PFUP level -1 diagram).

10. Recommendations

This project may help the PFUP to work forwards for future new project. The PFUP needs an electronic registry and electronic data collection system as a solution to improve the quality of the data collection and the perinatal development assessment follow up. The electronic system will provide automatic updating of the development assessment

data between the PFUP patient's chart and database, which will improve the quality outcomes and development assessment services (Craswell, Moxham , & Broadbent, 2013). Implementing an electronic data collection system will reduce the time spent to search the chart for collecting information, human error, and information redundancy. It will improve patient safety and patient data flow in the PFUP. Also, the system will increase the productivity by retrieving information easily and the timeliness of PFUP staff by rapid and accurate communication to over come the PFUP daily challenges (Silow-Carroll , Edwards, & Rodin , 2012).

11. Conclusion

The author's internship at IWK – division of perinatal department was challenging at the beginning, but experience was the greatest reward. This opportunity helped the author to apply the Health Informatics knowledge to solve real medical organization problems. The author gained critical thinking skills to accomplish the solution as system analysis.

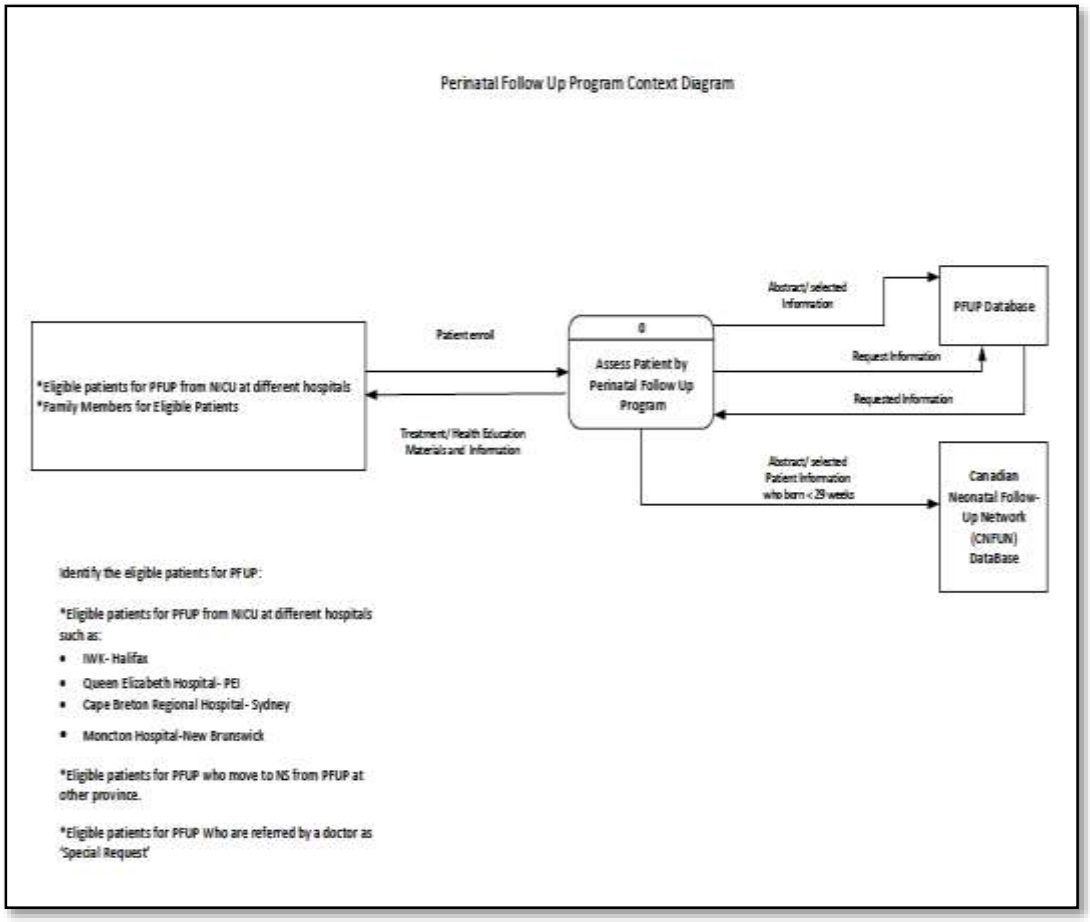
The project objective was accomplished as the author planned at the beginning of the internship period. The author was able to fulfill tasks and assigned responsibilities during the internship. The PFUP data flow diagram as the context, Level-0, and Level-1 diagrams were completed by the author and confirmed by the PFUP director. This project work was done as part of system analysis duties to develop the data flow diagram to meet both director and end users need.

The PFUP at the IWK Health Center was established more than two decades ago to provide development assessment for the high-risk infants. The PFUP was conducted as standard procedures; however, this medical service was developed frequently to improve efficiency. The PFUP workflow contains complex processes, which make the visualization of the PFUP processes one of management's priorities. This data flow diagram project is the first and unique work to visualize the PFUP processes at IWK. The completed data flow diagram will be very useful to improve the communication between the PFUP team members, new team members, internship students, data analyst, and IT system developers.

The author recommends continuing the future PFUP plan for creating an electronic development assessment data collection system, which will be very useful for the PFUP. The implementation of an electronic system will improve the PFUP outcomes and help to store and retrieve the PFUP patients' development assessment information safely and easily. Also, the electronic system will create new paperless environment for the PFUP at IWK Health Center.

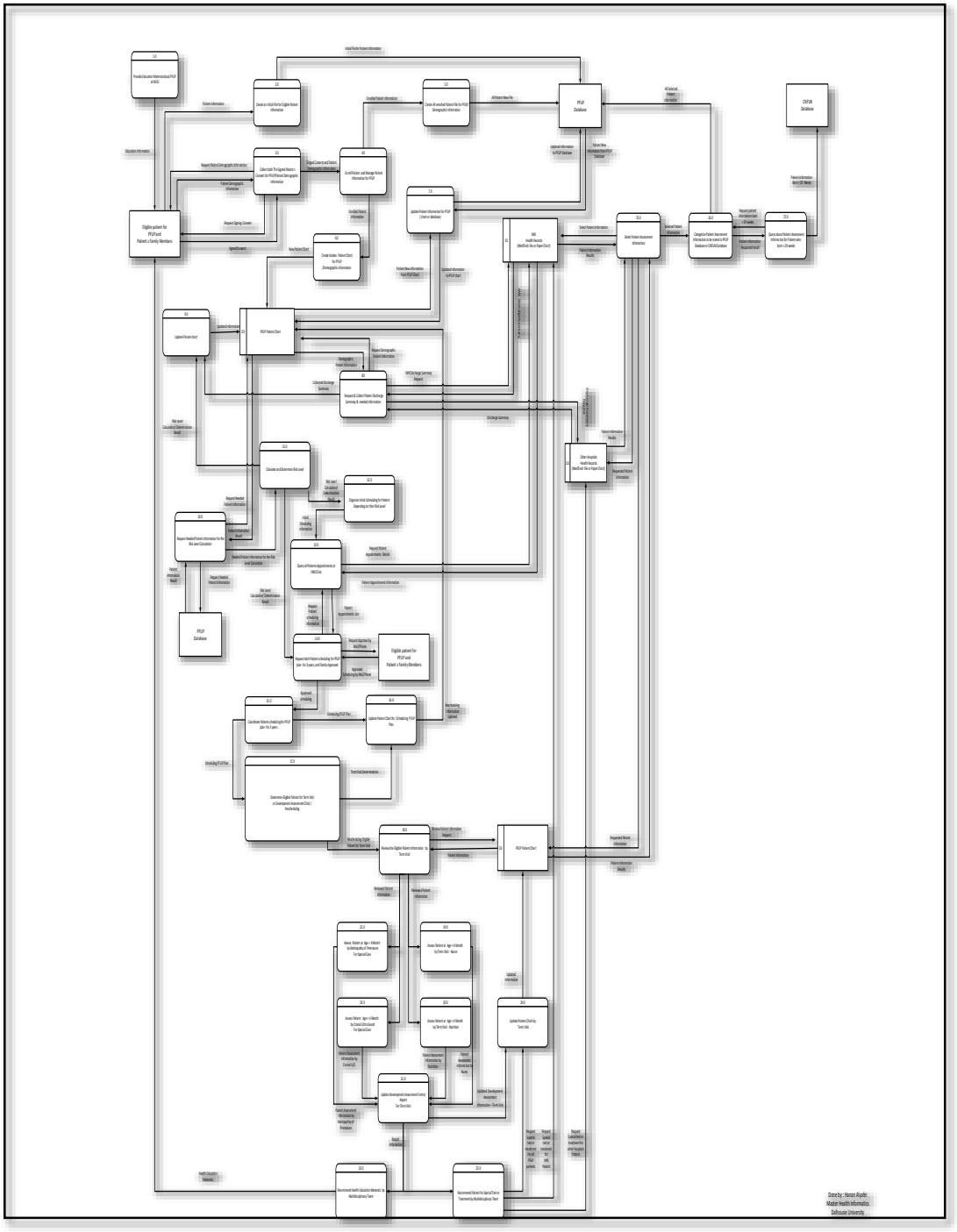
12. Appendix A

The Perinatal Follow Up Program Context Diagram

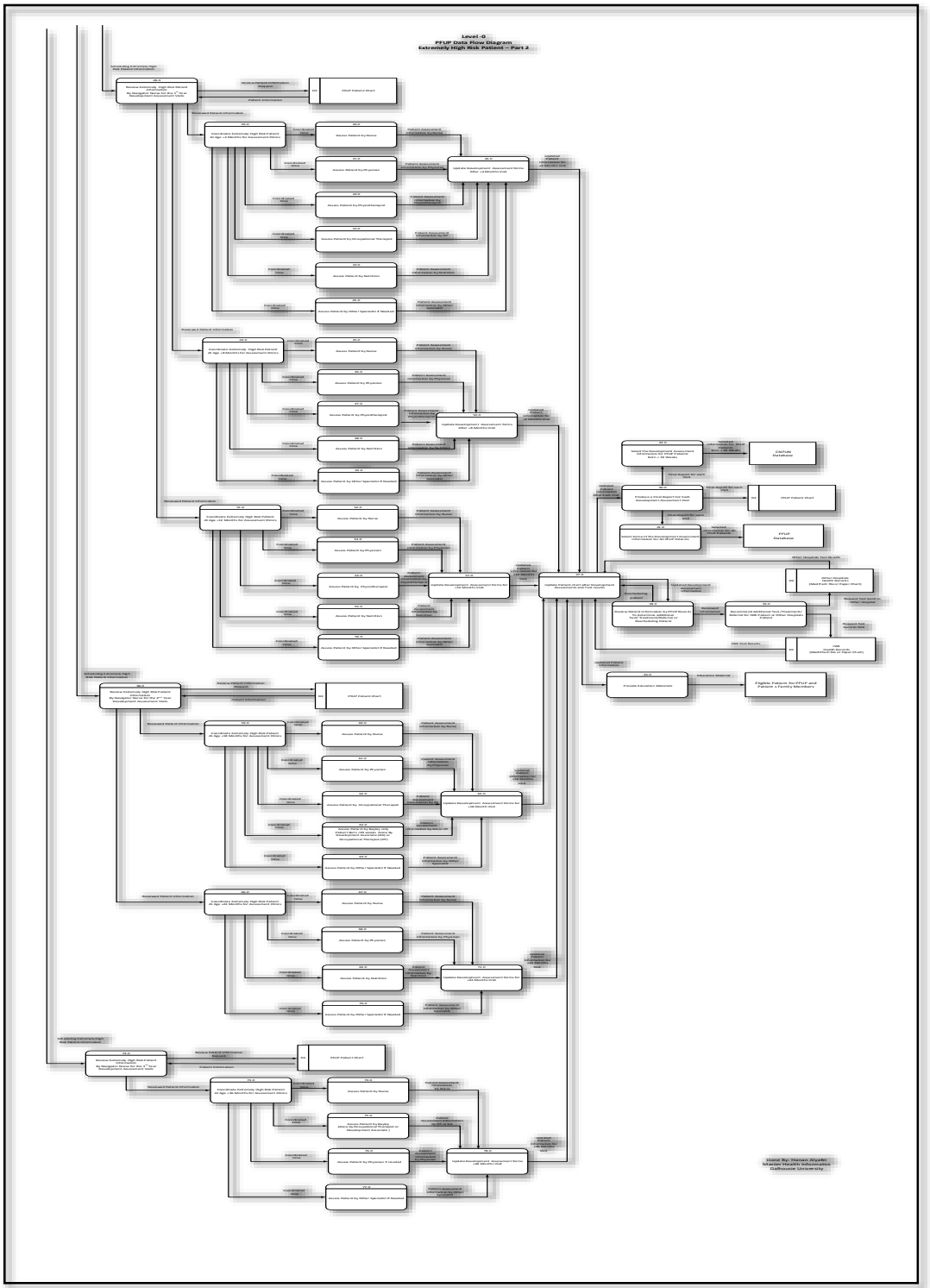


13. Appendix B

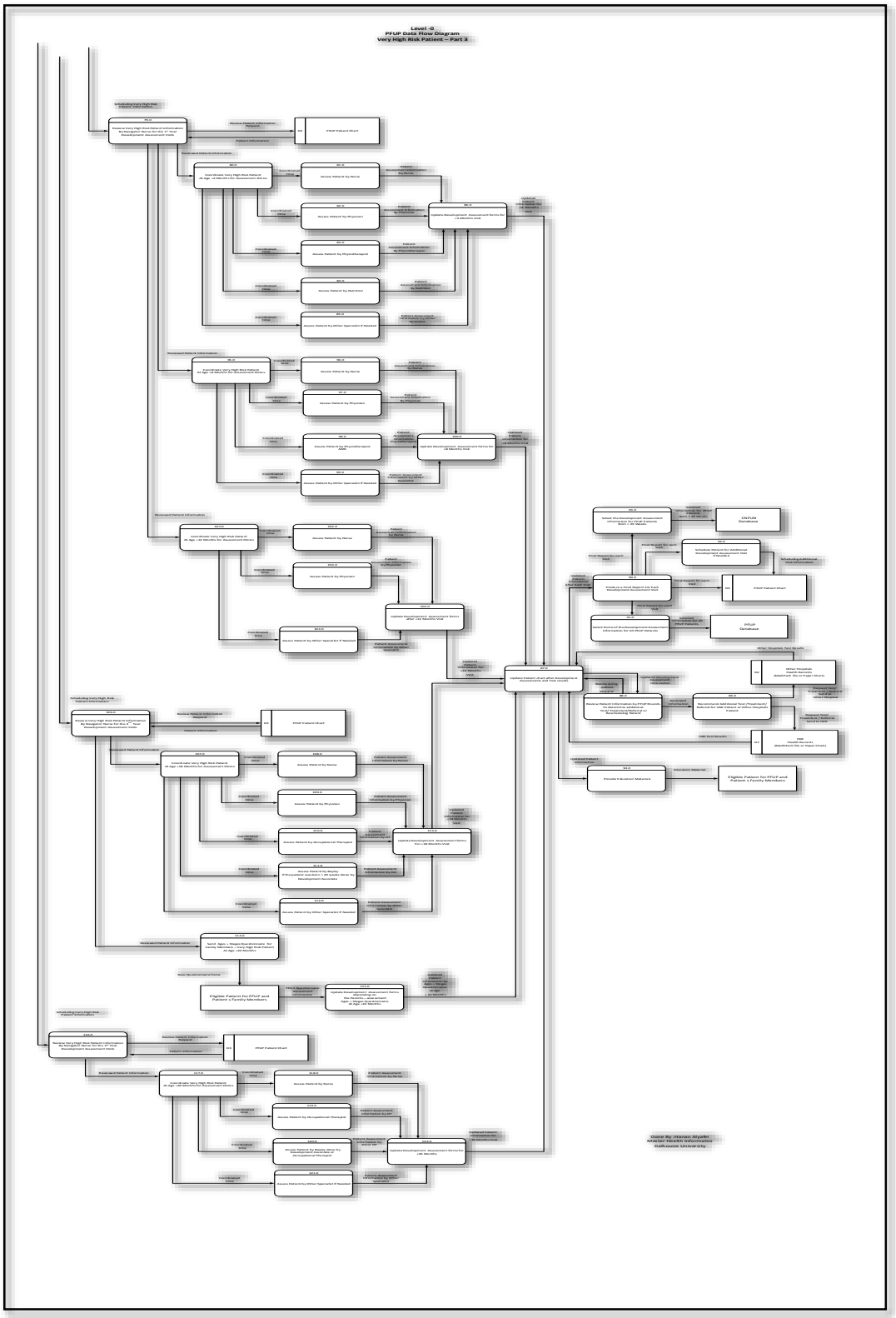
a) The Perinatal Follow Up Program Level- 0 (Term Visit) Diagram- Part 1



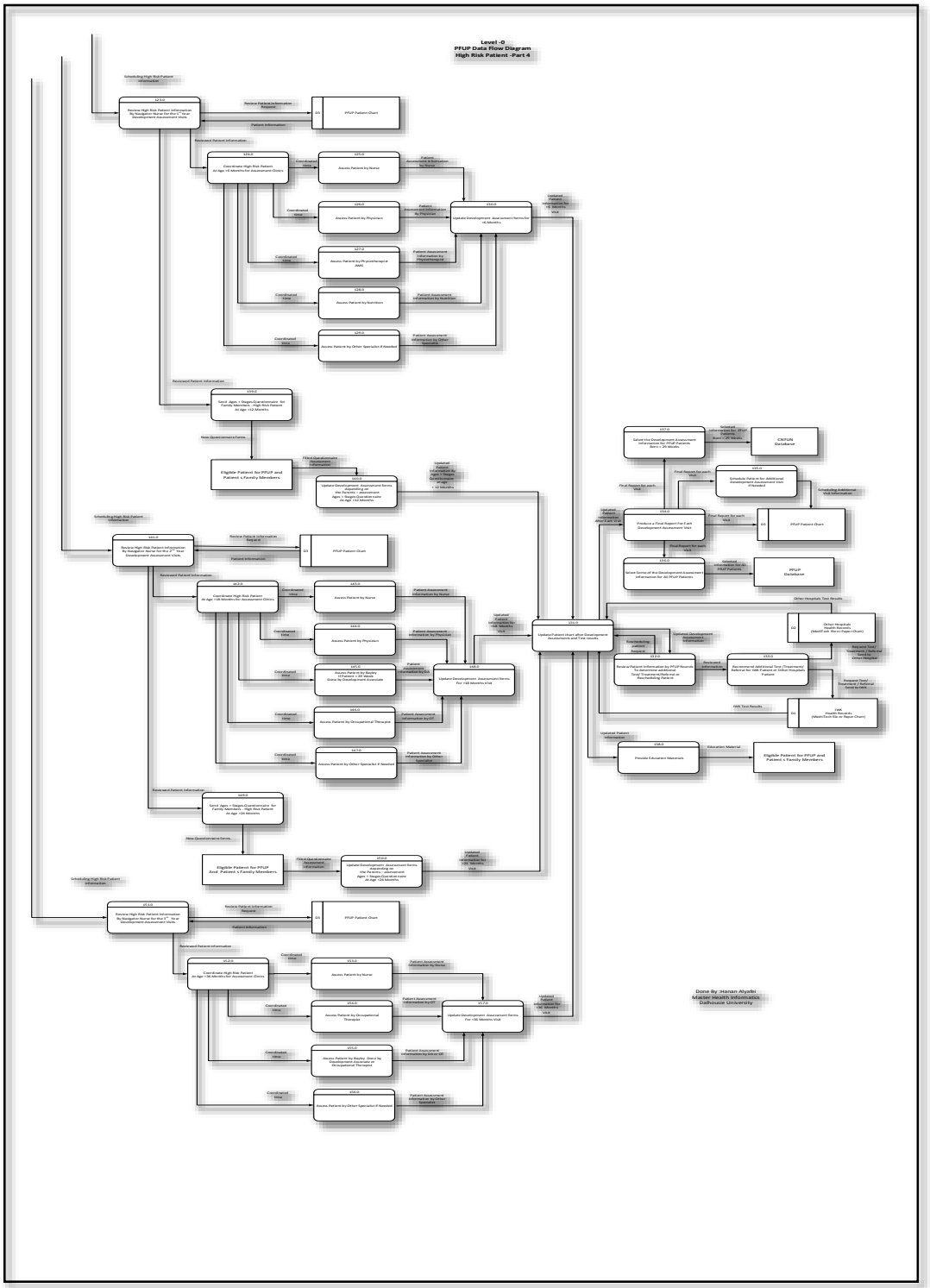
b) The Perinatal Follow Up Program Level- 0 (Extremely High Risk) Diagram- Part 2



c) The Perinatal Follow Up Program Level- 0 (Very High Risk) Diagram- Part 3

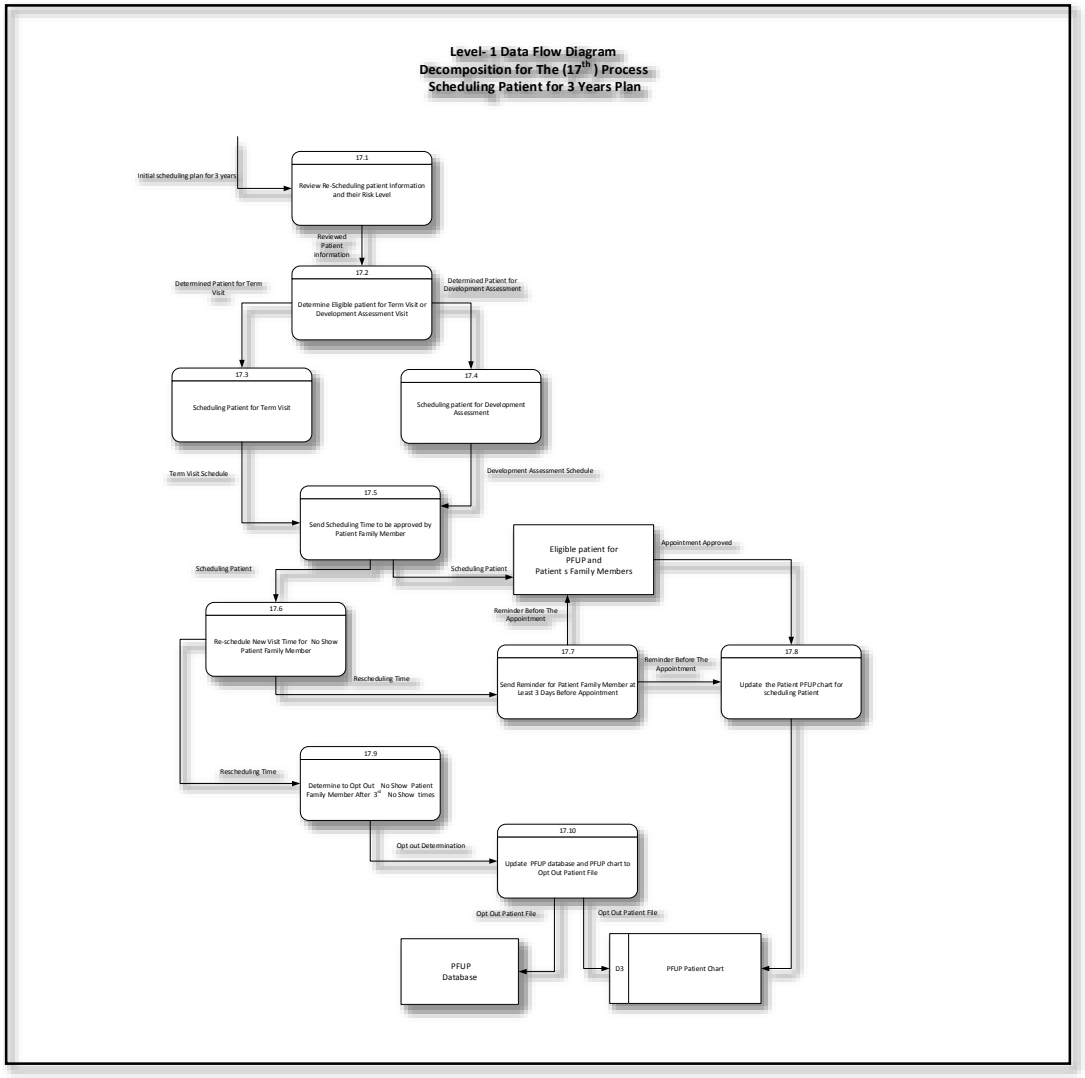


d) The Perinatal Follow Up Program Level- 0 (High Risk) Diagram- Part 4



14. Appendix C

a) The Perinatal Follow Up Program Level- 1 Diagram



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