

# Methadone Maintenance Treatment service evaluation and critical appraisal of the electronic database at Addiction Prevention and Treatment Services, Nova Scotia Hospital

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**Supervisor's acknowledgment**

This is to confirm that Patryk Simon has satisfactorily met all expectations and goals of the internship.

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## **Acknowledgement and Endorsement**

Patryk Simon has written this report in partial fulfillment of the requirements for the Master of Health Informatics Program at Dalhousie University. This report has not received any previous academic credit at Dalhousie University or any other institution.

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Patryk Simon

## **Executive Summary**

This report summarizes the internship work of Patryk Simon, a Master in Health Informatics candidate. The internship was completed from April 26 to August 19, 2011 at the Addiction Prevention and Treatment Services (APTS), Capital Health. APTS is responsible for providing addiction treatment to adults within Capital District Health Authority.

The two main objectives of the internship were to re-evaluate Methadone Maintenance Treatment Service (MMT) using health data from the Addiction Services' electronic database, called ASsist, through discussions with APTS staff, examine how information and clients flow between APTS services, and how ASsist helps or impedes these processes. Finally, the report provides a critical evaluation of ASsist with respect to health information standards and what steps are necessary to transition to the electronic health record.

One major problem with ASsist, which was highlighted by the MMT service study, is that very few parameters highlighted in the research literature can be obtained from ASsist. For instance, drug use history, medical and psychiatric history, or treatment protocols provided cannot be extracted. Furthermore, employment status, education, income, recorded at the time of admission to service cannot be obtained as only last modified information is saved. This poses a significant challenge in future studies of clients seeking services of APTS. Tracking clients through a continuum of APTS services is difficult; at present referral recommendations are not used.

Discussions with clinical staff of five areas of APTS as well as the work and information flows highlighted the redundancy in the existing processes and how the information obtained is used. As clients progress through the continuum of services of APTS, they are required to complete multiple intakes for each service, essentially providing the same information. This may be a barrier to some clients. Discussion participants identified there are gaps in information they have available at hand about a client and they defined their future information technology needs to include case noting, scheduling, seamless flow of collected client data between services, managing waitlists and a greater accessibility to information available within CDHA.

Although ASsist is an electronic database, it does not meet any health information standards. It also is not interoperable; it does not allow for exchange of information with other information technology solutions. Recommendations provided outline both the short-term and the long-term goals, which will help APTS in alleviate the duplication inherent in the existing processes and in adopting a more comprehensive solution, an electronic health record.

The internship was a valuable learning experience for the author. Conducting a health service evaluation using health data, discussions with APTS staff, and documentation of existing flows were time-consuming but useful processes. They allow the organization to discover areas of inefficiencies and provide concrete steps that the front-line staff see as essential in making service improvements.

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## 1. Introduction

Addiction treatment services generally constitute a small portion of all health services [1] but addiction has significant implications for all of society. The World Health Organization estimates that there are over 2 billion alcohol users and 185 million drug users worldwide [2]. Opioid dependence is a devastating chronic illness, which according to many research studies is associated with comorbid psychiatric disorders and a multitude of other issues such as increased rates of HIV and Hepatitis C infection and transmission as well as premature mortality [3]. Aside from direct health care issues, substance abuse has a profound impact on other dimensions such as safety of individuals and communities or law enforcement [4].

Clients affected by substance abuse disorders are often ambivalent about seeking treatment, have a low tolerance for waiting and continue using drugs while on a waitlist [5]. While the modalities of substance abuse treatment often vary depending on the substance of choice, with respect to opioid dependence, methadone maintenance therapy has become a standard pharmacotherapy for opioid dependence throughout Canada [3].

There are numerous studies providing evaluation of methadone maintenance treatment programs on both the international and national arena [6-14]. These studies range from attempts to define the characteristics of clients that are seeking treatment through methadone maintenance by examining retention in programs, to those examining outcomes in multiple domains, such as health and socio-economic factors.

Within the local context, Addiction Prevention and Treatment Services (APTS) of Capital District Health Authority has conducted a study in 2003 to examine if the Methadone Maintenance Treatment (MMT) service was achieving its goals of reducing inherent dangers of injection drug use, reduce drug use/dependence, criminal activity and increasing positive lifestyle changes [15]. Since August 2007, APTS together with other Addiction Services units in Nova Scotia have begun to use a province-wide web-based relational database, called Addiction Services Statistical Information System (ASsist) [16]. This database is maintained by the Government of Nova Scotia's Department of Health and Wellness. The goal of the system is to allow clinical staff to record information on clients seeking and accessing services for treatment of addiction and at the same time allow the information to be accessible to other Addictions Services' clinicians in the province of Nova Scotia.

In recent years, information technology has permeated all areas of our life. With respect to health care, the application of information technology promises to deliver safe, efficient and effective health care [17]. The goal is for all parties involved, including patients, clinicians, managers and researchers, to have the right information at the right time and the right place to not only promote safe care but also to also foster timely access to care. Given the challenging population of substance abusers, the timely access to service and intervention are of paramount importance to drug treatment programs.

One of the objectives of the internship was to re-evaluate the MMT service in light of existing research evidence with a primary focus of exploring the existing data in the ASsist database. The period of study was April 1, 2007 through March 31, 2011 as this was the period for which data

was available on ASsist. Although ASsist did not begin functioning until August 2007, many MMT clients who started the MMT service prior to August 2007 were backdated in the database. The list of clients who were active during the period of study were also obtained from Kardexes – operational paper documents in the MMT service. The list of clients in ASsist and that obtained from Kardexes were compared. Missing information was obtained through a review of paper charts. After many iterations of data export, preparation and cleaning, the exploratory analysis of data was conducted (please refer to section 5.1.6 for description of the challenges and actual process). The goal of this analysis was to examine MMT service population and compare the findings to research literature.

By conducting the MMT service evaluation, the author learned about ASsist's database design, the type of information it allowed to record, and the functionality of the system with existing workflows in clinical setting. These tasks were performed in order to allow for a critical appraisal of the existing ASsist database in light of health information standards. Information was gathered through staff meetings, observation of workflows, and reviewing existing documentation. With documentation of each process, recommendations were made to improve the existing flow. Business models with feedback from staff were described in written format and depicted graphically through flowcharts created with Gliffy (a web-based diagram and flowchart software) which is available free of charge at <http://www.gliffy.com>

This report is divided into two parts. Part I is focused on the Methadone Maintenance Treatment program re-evaluation. Part II documents the information and work flows within and between some of the APTS services with feedback from staff. Finally, the report provides a critical appraisal of the ASsist database from Health Information Standards perspective.

An inquiry was made to the Research Ethics Board of Capital District Health Authority to clarify if ethics approval was required for this study. The response received indicated that since the study was a part of an ongoing service delivery evaluation at APTS, no approval was necessary.

## **2. Addiction Prevention and Treatment Services (APTS)**

Addiction Prevention and Treatment Services (APTS) is Nova Scotia's largest provider of substance abuse treatment services. It is one of the core services within the Capital District Health Authority (CDHA) and primarily serves the population of Halifax Regional Municipality free of charge. APTS provides a variety of addiction related programs and services with the overall goal of promoting the health of individuals, families, and communities in Nova Scotia [18].

APTS has its main office in Dartmouth, Nova Scotia Hospital, with several satellite offices across the Halifax Regional Municipality. There are five community-based services and four hospital based programs [19]. Methadone Maintenance Treatment is a service that can be described as a blended service between hospital and community, given that during the initial phase, clients are stabilized on the Withdrawal Management Inpatient unit (hospital-based) but once the initial stabilization is completed, clients attend day services similar to other community services.

### **3. The Author**

While the MMT study was well underway, the author was hired as a Research and Statistical Officer within the APTS services. Given the length of time it took to complete data preparation for the MMT study and new responsibilities, the author had discussed the internship goals with Shaun Black and subsequently the author met with Dr. Grace Paterson on June 1, 2011. All parties agreed to amend the goals of the internship. The second project that had been identified prior to the internship was to examine and develop a framework for triage for the Withdrawal Management Inpatient. Given the time constraints and new responsibilities, the amended goal was to conduct a critical appraisal of ASsist with respect to health information standards. This report discusses all internship milestones with the amended goals in mind.

The author was employed as a Health Informatics Intern to:

- re-evaluate the Methadone Maintenance Treatment service
- examine shortcomings of ASsist with focus on information and work flows, and
- conduct a critical appraisal of ASsist with respect to health information standards, requirements definition and strategic planning for migration



## 4. Background information on the ASsist database

In August 2007, Department of Health and Wellness completed the implementation of the Addiction Services Statistical Information System Technology (ASsist) across all provincial health services providing care to individuals affected by substance abuse disorders [16]. This database aims to function as an electronic file as well as a database management system for research, quality improvement and statistical information used to guide programming and resource decisions.

The database system is accessible through a web-based interface. The information is primarily entered via free-text with a few drop-down menus for items such as gender and some demographic information (such as county and province of residence). Client information such as name, date of birth, health card number are all entered as free text. The same is true for the majority of information collected at intake. Treatment history, currently abused substances, medical and psychiatric history, currently prescribed medications are all predominantly captured through free text. During the process of registration, treatment issues are re-entered using both pull-down menus and free text. The extent of information captured on ASsist is limited to the information collected at intake and registration. The database appears to serve a more administrative/operational purpose than support clinicians in their work with clients – greater clinical focus is needed. Furthermore, not all fields that capture clinically important information are required, which poses difficulties with respect to data completeness.

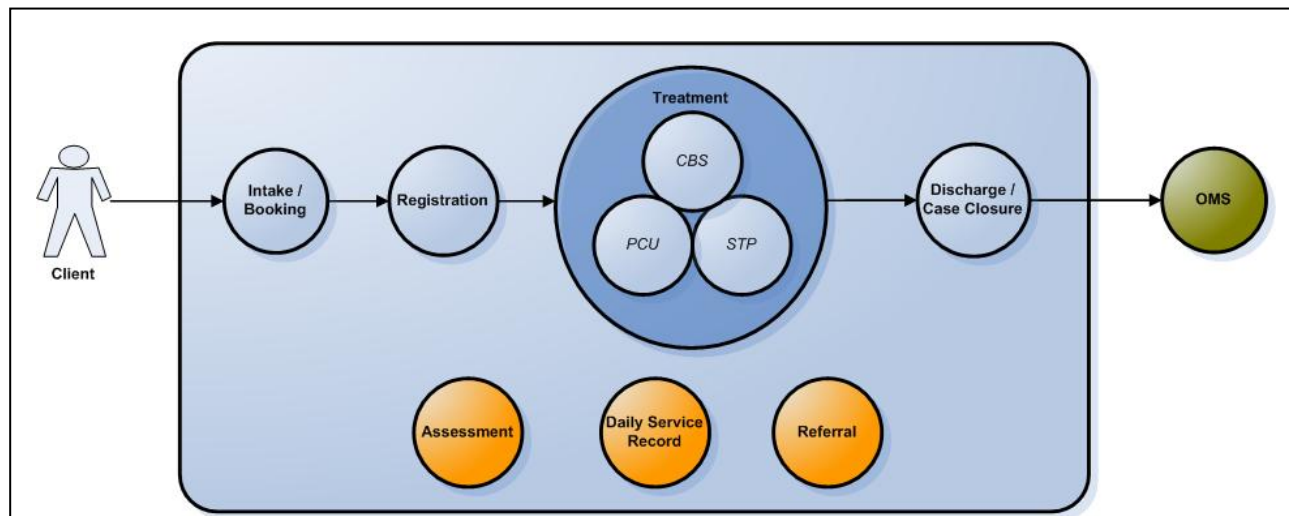


Figure 1: General overview of ASsist business rules

### 4.1.1 High level overview of ASsist business process

To help the reader understand the complexity of the database, an overview of the general admission process is necessary. The highly abstract view of the data recording process and client's progression through APTS services is demonstrated in Figure 1 [16]. A client, who seeks APTS services, must first complete an intake via phone or face-to-face. During the intake, client demographics, preliminary drug use and treatment history, medical and psychiatric histories are obtained. Only when a service is available – for an example a client seeking acute withdrawal service will have to wait until a bed is available – and client arrives does the registration occur. During the registration, intake information is verified in person and additional information is re-

collected such as substances abused/gambling issues and those are recorded in ASsist. A separate admission and progress notes become a part of paper chart. Community Based Services (CBS), PCU (Primary Care Unit – refers to Withdrawal Management services) and Structured Treatment Program (STP) are some of the treatment service areas of APTS.

In all service areas, the Daily Service Record (DSR) is completed in order to capture the time and activities related to client care. This is generally done for all client related activities, such as capturing time spent on intakes and registrations, one-on-one client counseling or group sessions. With the exception of two services, the Withdrawal Management Day and Methadone Maintenance Treatment - Daily Service Records are entered into ASsist directly by a clinician. In case of Withdrawal Management Day the Methadone Maintenance Treatment services, clinical staff capture activities related to client care on paper and then the administrative staff enter the data recorded on paper into ASsist.

Clinicians make referrals to other agencies/services within APTS, Capital District Health Authority, or Halifax Regional Municipality while client attends services. A client is discharged when he or she completes the treatment process, is dismissed or stops attending. The outcome Monitoring System (OMS) is a survey conducted after discharge in person and via phone to solicit client's feedback on experience and health outcomes.

In cases when a client seeks further treatment through APTS services, he or she is required to complete a separate intake for that service. This is irrespective of the fact that the client may have provided the same information a few days prior during the intake for the first service they accessed.

## **5. Part I: Methadone Maintenance Treatment evaluation**

### **5.1 *Activities Performed***

#### **5.1.1 Defining objectives of the study**

Initially, the author held meetings with internship manager, Shaun Black and Tony Jenkins, manager of Withdrawal Management Services to define the scope of the project. Subsequent meetings were held with the Methadone Maintenance Treatment team to discuss their expectations and potential research questions.

#### **5.1.2 Literature Review**

Once the primary focus was identified, the author reviewed the results of the First Voice study [15]. Subsequently, the author conducted a preliminary literature search to identify the breadth of studies on the topic of methadone maintenance treatment. Given that the First Voice study examined client demographics and client specific outcomes, the literature that was harvested included these parameters. During the course of this study Cochrane Reviews, PubMed, Medline and the web were searched for methadone maintenance treatment outcomes and retention factors. A combination and variation of keywords included: “methadone”, “maintenance”, “treatment”, “retention”, “outcomes”, and “factors”. Once relevant articles were found, the author utilized the MeSH keywords in found articles to enhance search results. In total, there were 73 references found, but after careful examination, only 21 were considered to be relevant. A brief summary note

of research findings was presented and reviewed with Shaun Black and Alison Zwaagstra, the Research and Statistical Officer – Quality with APTS.

### **5.1.3 Exploring reporting capabilities of ASsist**

After receiving positive feedback on research findings, the author met with Alison Zwaagstra to explore the existing capabilities of the ASsist database. It quickly became apparent that:

- not all information entered into ASsist could be extracted through pre-defined queries
- there was no capability to create custom queries as the Department of Health and Wellness owned the system but was unable to make changes without third party developer involvement
- very few of the parameters identified in literature review could potentially be answered by analyzing only ASsist data. For instance, medication dose cannot be obtained.

### **5.1.4 Formulating and finalizing research questions**

Although the research literature reviewed provided numerous questions relating to factors of retention and positive outcomes, there were limitations in the types of questions that could be asked. With a primary focus on analysis of health information database, any data that could have been largely obtained through manual inspection of paper charts was excluded. As a result, the final set of questions also focused on examining the general business rules. The final set of questions was presented to Shaun Black, Tony Jenkins, and the Methadone Maintenance Treatment team as well as distributed via email to the two physicians working with the APTS services for feedback. The feedback included a few semantic changes and it was incorporated into the finalized question set (See Appendix A). Five themes were identified; relating to client, MMT service, other APTS services, relapse and illicit substances clients reported.

### **5.1.5 Data collection**

The author had direct prior experience with the ASsist database working as a Nurse Rehab Counselor on the Withdrawal Management Inpatient unit of Nova Scotia Hospital. As a result, the author already had access to the clinical data recording aspect of the database and was familiar with the type of information and the level of detail of each client encounter that was captured within the ASsist database interface.

Once the final set of research questions were defined, the author obtained a higher level of access through Alison Zwaagstra who manages access to ASsist for APTS services. The Department of Health and Wellness was notified of the author's work on the project and the new level of access. This new level of access allowed the author to use the pre-defined queries interface to extract information from the database.

The ASsist database interface allows retrieval of data in aggregate fashion only through a pre-defined set of queries. This posed a very significant drawback, as the predefined queries were not specific to one program and provided snapshots of client information. For instance, information relating to intake is retrieved separately from information relating to registration. Treatment issues identified by clients on registration are retrieved through another separate query, though they are part of the registration process. The results of queries are exported as Microsoft Excel spreadsheets, and unfortunately do not include all the information that was collected and entered into ASsist. For instance, reason for client's contact, medical and psychiatric histories collected at intake are not included in any of the queries. Irrespective of these challenges, twelve queries were identified as

relevant to the evaluation of the MMT service. For each query, the period of April 1, 2007 through March 31, 2011 was used and each query was extracted as Microsoft Excel spreadsheets.

### **5.1.6 Data cleaning, preparation and linking of datasets**

All extracted query spreadsheets were opened in Microsoft Excel and values for each of the attributes were cleaned. For instance, the intake date attribute by default included both date and time stamp, but with only the date being relevant, the time portion of that field was discarded. Since no data structure dictionary was available for the ASsist system, to better understand the query functionality, each query was examined and random sample of records in each query was compared with the same information available through the clinical data-recording interface. This was an iterative process until all attributes extracted in a query could be understood and put in context of how each attribute reflected data captured through the clinical data-recording interface e.g. intake or registration screens.

Given the fragmented nature of client data as queries, a reasonable approach was to attempt to establish links between each query by creating a relational database management system and attempt to create a more comprehensive “picture” of each client record. In this process Microsoft Access was utilized, as this was the software available on workstations at APTS. Each query result set was imported into the new database. Then each resulting table has undergone a process of normalization to help create a relational database as per Kroenke and Auer [20].

This process revealed that completeness of records varied between queries. For instance, the Registration query (with 19,192 records) generally includes registration information and the associated intake. However it contained 23 fewer registrations than the intake query with associated filtered registrations (19215 records). Furthermore, it became evident that two queries did not work as intended, given that in one instance whole service was not included in the result set when it should have. In the other instance, the query was missing information primary key on 40% (800 of 1892) records effectively making it impossible to establish relational database links with the results of that query. Independent verification of validity of assumption of missing data was done through the clinical data-recording interface by author and Alison Zwaagstra. The Department of Health and Wellness was notified of this discrepancy and defunct queries.

To address the large number of missing records for some queries, a customized piece of software was written in REALBasic by the author. This software was used to retrieve attributes of interest via the web interface. This software was used to complete the missing primary keys for the “Referral recommendations” query and to retrieve medical and psychiatric histories as well as treatment protocols administered to clients during admission.

Once the dataset was completed, a set of customized queries were created in Microsoft Access, which were aimed at addressing the questions of the study. Following this process, exploratory analysis began. However after the preliminary findings of exploratory analysis had been completed and presented to the Manager of Research and Pharmacological Services at APTS, given the small sample size, the author explored if it was possible to include data from a DOS-based STATiS database which was in use prior to ASsist. However, it quickly became apparent that data extraction from STATiS was difficult and a period of time 2004 through 2005 had missing data for some clients. Given that the one of goals of the study was to examine services accessed prior to

MMT service admission, the study was limited only to new clients – that is, clients that were admitted to the service after April 1, 2007. This resulted in a sample of 115 unique clients that started MMT program between Fiscal Years 2008 through 2011 with 880 program registrations and 1097 intakes. To assure completeness of all records, record of admission was verified against the MMT unit Kardexes – a paper document with basic client information used for day-to-day operations. All clients were verified and for 9 clients who did not have a record of admission to MMT program on ASsist, paper charts were obtained and relevant data was collected. The relevant information was also entered into ASsist for future use. This process was completed by the last week of May 2011.

### **5.1.7 Analysis of data and Report writing**

Prior to analysis using the STATA statistical software version 10, descriptive statistics were computed for the participant sample. As applicable, statistical measures such as t-test, Wilcoxon-Mann-Whitney tests, Kruskal Wallis test, ANOVA and factorial ANOVA were conducted. The completed study with background, methodology, results and discussion is presented in Appendix B.

## **6. Part II: Information and work flows and shortcomings of ASsist**

### **6.1 Activities Performed**

#### **6.1.1 Defining the Project**

While the MMT study was underway, the author met with Shaun Black and Alison Zwaagstra to help identify stakeholders from each service area of APTS whom would be able to provide the author with feedback on existing processes as they relate to clinical care and ASsist. It was agreed that existing processes be documented as flow charts for each service area to provide a clear picture of the information/work flow. Seven individuals were identified from each service area of APTS and two individuals from the Capital District Health Authority IT services. CDHA IT services were consulted to examine the potential involvement in future migration of APTS services with CDHA enterprise systems.

#### **6.1.2 Review of prior work**

In 2010, the Barrington Consulting Group, Inc. was hired by the Health Promotion and Protection division of the Department of Health of Nova Scotia to conduct a province-wide review of business processes as they related to ASsist [16]. The review process involved discussions with key stakeholders and at the very high level, illuminated key weaknesses and gaps between processes implemented in ASsist and the processes currently followed by end users. The fundamental difference between the review conducted by the Barrington Consulting Group and this work are the level of detail documenting the existing processes within each service area of APTS and documenting what exchanges occur when client moves from one service area to another.

#### **6.1.3 Research**

The research phase involved examining the existing framework for documenting patient and information flows. Research indicates that Business Process Modeling is one of the approaches to documenting the existing processes and has been applied in health care settings [17]. Prior

experience of the author with Business Process Modeling and Unified Modeling Language during the course of this Master of Health Informatics program has given direction to this process. A set of guiding questions was devised to help the author document the process based on the guiding principles for business analysis discussed by Benson [17]. In order to provide an accurate documentation of information and work flows, the author asked additional questions during the discussions. See Appendix C for these guiding questions.

#### **6.1.4 Soliciting feedback**

The author received responses for meeting requests and met with individuals from five (71.4%) different service areas of APTS and one representative from CDHA IT services. To provide historical perspective on ASsist and database systems at APTS, Alison Zwaagstra was invited to the discussions with CDHA IT services. The author conducted discussions with each service area of APTS.

The discussions with the representative from CDHA IT Services revealed that APTS is one of three areas not integrated with the enterprise systems of CDHA. However IT Services staff would be able to provide resources and assist APTS in becoming part of the existing infrastructure to assure integration of data with other CDHA enterprise systems. This information was shared with Shaun Black and two questions were added to the guiding questions, which allowed the author to explore requirements of an electronic system for APTS.

The feedback collected from each service area was obtained and flow diagrams were created in web-based diagram software, Gliffy, which was available free of charge. The written feedback with flow diagrams was then circulated via email to members of respective service areas for additional feedback and changes. Where necessary, the author met with staff in person either one-on-one or in a group during a staff meeting to review changes. All feedback was incorporated into the final product.

Due to size, only one example of the flow diagram is included in this report in the Appendix D. All flow diagrams are available as an electronic Microsoft Excel file at

<http://web.unbc.ca/~simonp/Internship/InternshipAPTSFlows.xls>

Appendix E provides a cumulative overview of feedback received from staff on ASsist and future IT needs.

## **7. The Relationship with Health Informatics**

The work performed during the internship has strong relationship to health informatics and prior learning of the author in the Master of Health Informatics. The internship involved the examination and statistical analysis of health data; it also included a review and documentation of information and patient progress through each service of APTS as well as between APTS services. In addition, it involved looking at the existing system through the lens of health information standards.

This work was closely aligned with several courses, which were a part of the Master of Health Informatics program. Specifically, the skills acquired in the Statistics for Health Informatics (HINF6030) and the Data Mining for Health Informatics (HINF6210) courses was utilized in the process of MMT service evaluation. Finally examining existing information and work flows built

on the learning in the Health Information Flow and Standards (HINF6102) course. During that course, the author had examined a similar project dealing with the information and patient flows between the Withdrawal Management Inpatient unit and the Methadone Maintenance Treatment service of APTS. The internship work was an expansion of this project by inclusion of other services of APTS and was tied together with program evaluation. The business process models considered both person-to-person and person-to-computer system interactions. The diagrams were designed incorporating swim-lanes for readability and identification of types of the two interactions previously mentioned. Furthermore, each diagram has a number of decision points outlining the different pathways for each possible scenario.

The critical evaluation of the ASsist electronic database was conducted using the frameworks discussed in the HINF6102 course as well as using the existing research evidence on health information standards and interoperability.

## **8. Health Informatics Problem and Solution**

This section contains an overview of the findings from the methadone maintenance treatment service study and discussions with five service areas of APTS. The author hopes that this section will help the reader to understand the need for a more robust solution to what APTS currently has available.

### ***8.1 Findings from the Methadone Maintenance Treatment service study***

While the study results are presented within the MMT report in Appendix B, this section aims to illuminate issues as they relate to health information. The most prominent issues are listed below:

1. Only the last modified client demographic information such as employment, marital status, education, income source, physical/mailling address, number of dependents is saved/stored

This issue has an impact on research of any population attending any APTS service. Since only the latest information is available, tracking any changes is impossible. For instance evaluating if a client became employed, moved to a “better” neighborhood, changed jobs, enrolled in school as a result of ongoing treatment received is not an option.

2. Referral recommendations

A section of ASsist interface that is currently underutilized. It could allow staff to record what other APTS services were recommended to clients. If the information was completed each time, a progression of care (pathway) between different APTS services could be established. The issue however is that at present the query for the “Referral Recommendations” does not work.

3. Recording of information relating to treatment issues at the time of registration

Currently a flaw exists in the recording of treatment issues, which allows a clinician to save the registration without identifying the substances/gambling issues a client is admitted for. A clinician only has to enter a sequential number into Treatment Issue Number. This prevents from adequate capture of data as it relates to treatment.

4. Treatment protocols

For APTS services that provide medications/treatment protocols to clients, the recording of protocols administered is not a required option. Furthermore, at present it only captures the name of the protocol that was administered. Tracking dosages of medications given is not possible. This effectively limits any research into the effectiveness of treatment protocols in relation to treatment issues identified.

5. No standardized coding system is in place to identify all medical and psychiatric issues self-reported at intake

Medical and psychiatric history plays an important role in understanding client treatment needs. At present, the information is captured through a short 27 item list of general medical problems. Mental Health is one of the options available to select, but no further detailed classification is available. Establishing population with concurrent disorders (substance abuse and a psychiatric diagnosis) or identifying clients with co-morbidities is impossible outside of manual chart reviews.

## **8.2 Findings from discussions with APTS staff**

The feedback received during meetings with staff identified several issues with the existing database. The most salient issues raised are summarized below:

1. Inability to document progress notes electronically

Currently case notes are documented through paper charts. Each service area has its own unique set of forms that are being used to document treatment/care given to client. While ASsist has the option to record some tasks (e.g. phone call with client or time spent doing intake for a given client), the database does not allow documenting all care given electronically.

2. Timely access to client records is not possible. Information is within each service area, in multiple places, fragmented

Addiction requires long-term treatment. Although APTS services are structured to provide care on the continuum from acute to community services, information relating to treatment plans and outcomes is retained at each point of service. For instance, relapse prevention plan decided by client and staff on the Withdrawal Management Inpatient unit is not readily available in the Community-Based Services offices. The chart does not travel with client, rather similar information is re-collected at the next point of care.

3. ASsist database is a provincial system for addiction services only. In daily care of clients, clinicians need greater access to client specific information available within CDHA services than what ASsist provides



ASsist has been the primary source of brief information on the types of services a client accessed in the past within addiction services, province-wide. While information on prior addiction treatment is important in planning of care, it often reflects older information than the most recent experience of client with health services. For instance, the Emergency Room visit of client that occurred last week for suicidal ideation would be more pertinent in planning of care than the fact that client was in inpatient detox in Yarmouth for treatment of opioid addiction abuse 2 weeks ago. Although it is valuable to view information from Yarmouth detox, it would be more beneficial to clinicians to see information on client care received within CDHA.

All service areas have agreed that having access to local health information was very important. With the exception of Withdrawal Management Inpatient, 4 other services indicated that it was more important than the information available in ASsist database.

### 8.3 Findings from work and information flows

The flow diagrams illustrate that ASsist is dictating not only what information is recorded in the system, but also how clients access services of APTS. Figure 2 presents a generalized overview of steps needed as client accesses a service of APTS. It is an abstraction of the information and work flows done for each of the five services. Please refer to flows for each service for a more detailed overview. Arrows (dotted and solid lines) denote potential ways a client can move between the services.

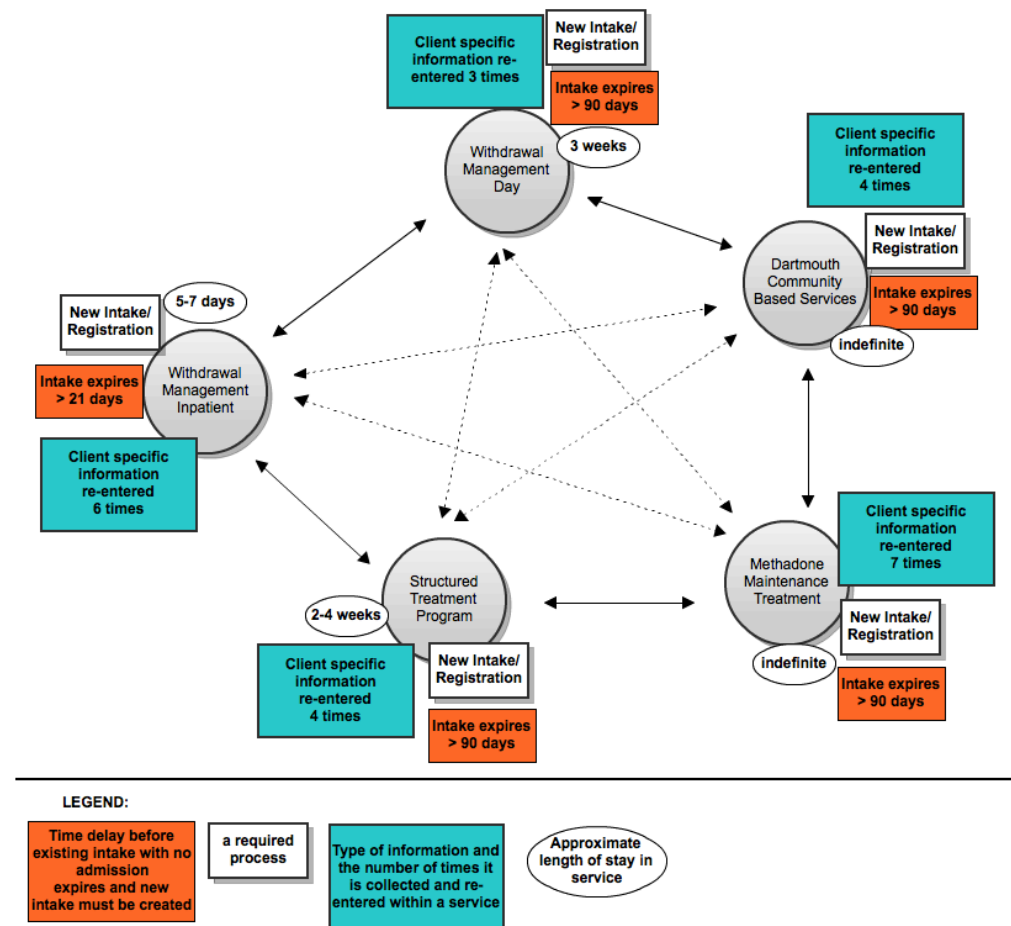


Figure 2: Abstract overview of client and information flow between services

The striking problem evident in the abstract flow is the fact that when client moves from one service to another, an intake/registration must be completed. Another issue evident is the amount of repetition built-in. APTS staff has to collect/re-enter information a client might have provided a few days prior when he or she accessed a different service of APTS. As an example, a client who is seeking acute withdrawal services on the Withdrawal Management Inpatient will complete an intake generally providing demographic information, treatment issues, history of abuse, medical and psychiatric history. After the inpatient admission, this client may choose to seek further treatment through the Withdrawal Management Day services. Assuming average length of stay in service, this client will be asked to complete another intake (with the same information) again within 5-7 days from the first intake. With respect to APTS staff, a clinician collects, re-enters and re-uses virtually the same information 6 times on the Withdrawal Management Inpatient and 3 times on the Withdrawal Management Day. This process of repetition occurs as client flows between each service. If a client already has an intake for a given service but the intake expires before the client is admitted (times denoted on figure 2), the client has to complete another intake - providing largely the same information – with the exception of changes to health and substance issues. It is also true that for a client who had accessed addictions treatment services at APTS in a more distant past, e.g. a year ago, and is seen again, he or she will have to provide information on substances abused, history of abuse, medical and psychiatric histories, leading to further duplication.

The issue of multiple intakes in each of the services poses a significant bottle-neck to client's continuation with services. Each bottleneck can be identified in respective service area flow diagram by the number of processes needed before client becomes (registered) admitted.

#### ***8.4 Summary of the problem: Gaps in information and lack of integration***

The author had the first-hand experience with ASsist data entry for a period of 2 years prior to the internship, while working as a front line staff on the Withdrawal Management Inpatient unit. The experience of data extraction and analysis during the Methadone Maintenance Treatment service evaluation shed light on data quality and the functionality of ASsist database. Furthermore, discussions with front line staff when soliciting feedback on patient and information flows, all demonstrated that there are numerous challenges.

Based on the findings discussed previously, the overarching problem evident to the author is two fold. For the clinician, it is the lack of access to client's information generated at each service that client visited. For the client, the general process requiring the client to contact the next service of APTS continuum to complete an intake may be seen by some clients as a barrier to further treatment.

Among populations of intravenous drug users in North America, only 18–36% are estimated to be receiving some form of drug treatment at any given time [21]. A major characteristic of drug dependence is relapse. The primary focus in treating drug abuse is providing supports for individuals who relapsed or at those who are in recovery but at risk of relapse [21, 22]. Usually individuals must be engaged in drug treatment for an adequate length of time in order to reap the

greatest benefits [13, 21, 23]. Furthermore, with the chronic nature of addiction, many individuals require multiple attempts at drug treatment before becoming drug-free [22, 24].

Addiction treatment is voluntary. In general, a client needs to make contact and commit to participating in treatment. Research examining characteristics of clients seeking addiction treatment argues that individuals seek services when they are ready [25, 26]. Some researchers suggest that having treatment available is equally important [27]. It is plausible to argue that for those who are unsuccessful in accessing treatment in the first place or those who do not follow through the continuum of care due to barriers, may be reluctant to try again.

As previously discussed, ASsist imposes inherent repetition that currently occurs as the client moves between APTS services. It is understandable that it is client's responsibility to seek help. However, in the current model of delivery of care, the responsibility falls on the client to repeatedly provide information on his or her history of abuse, present treatment issues, medical and psychiatric problems. As most of the staff have indicated in the discussions, having a client complete a new intake multiple times as he or she transitions from service to service impedes the process.

## **8.5 Proposed Health Informatics Solution**

A solution to the challenges described above is a robust Electronic Health Record (EHR). EHR is a set of computer applications, which generally allow for [28]:

1. A longitudinal collection of health information of a person and the care that was provided,
2. Rapid electronic access to patient and population level information,
3. Decision support to enhance the quality, safety and efficiency of care delivered,
4. Facilitate and provide support of efficient processes for delivery of health care.

According to research, the concept of the EHR is not new, but has been around for over 30 years [28, 29]. However, while many OECD countries have been pioneering EHR implementation and uptake, Canada and the U.S. have trailed behind. A study looking at EHR uptake among physicians in primary care in Ontario quotes that less than 30% of all physicians in Ontario use EHR [29]. Recent Canadian statistics from Canada Health Infoway suggest rates of 37% [30]. In countries such as Norway, Denmark, UK and Australia, nearly 95% of physicians use EHR. Some of the identified reasons relating to low uptake were no clear national policy directive and lack of incentives [29].

While these figures indicate there is much work to be done, the discussion on the reasons for the uptake is outside of the topic of this report. However, given the challenges identified at APTS, it is important to examine each of the EHR assertions and how it can help to address them.

Case noting traditionally has been done on paper. Paper records can unfortunately be only generated and viewed in one location and data about patient's health history and current situation cannot be easily shared [31]. Given that care is often shared and delivered by multiple health care professionals and settings, the problem of access to the right information becomes a challenge. As a result, duplication of effort in collection of patient specific information occurs [31, 32].

EHR makes it possible that patient data can be viewed from multiple locations in an electronic form, by authorized users [17, 31]. Ongoing progress notes are often called the Computerized Clinical Documentation and they are a component of an EHR.

Several studies have attempted to examine the benefits of electronic case notes over paper records for client care. Electronic notes are found to be more comprehensive and complete [33]. One study quoted that both timeliness of progress notes and legibility of information recorded in patient's record has significantly improved [34] and physicians were spending 26% less time on consultation visit, by minimizing the time it took to collect and review client related documentation as well as document their own notes. While extracting information documented as free-text can be seen as a challenge [28], some studies provide examples of integrating standardized care plans into electronic records. One study found that having standardized care plans available electronically was allowing nurses to provide the same standard of care to all clients [35]. Another study found that it significantly increased the amount of time that nurses were able to spend with patients [36].

At the same time, while less time was spent on paper records 18.1 minutes to 4.5 minutes (nearly 4 fold decrease), computer usage had increased from 7.8 minutes to 17.2 minutes (nearly 2 fold increase) in one study [34]. A systematic review of time efficiencies found a 24% decrease in the amount of time spent documenting during the shift [37]. However, study examining the electronic nursing documentation found that there were difficulties in finding important information because of the volume of routine notes [38].

While there is an ongoing need for continued research and evaluation of electronic health records effects on the work setting, it is important to consider that client needs should be in the center of discussions. A study evaluating the implementation of the EHR in Ontario argues that "patient satisfaction and confidence in the health system increases when information they provided to a health care provider some time ago is available to the provider they are seeking right now" (p. 3) [29]. This statement makes sense when one considers both the client and provider perspectives. For the client, the benefit of not having to repeat oneself seems logical. In cases when a vital piece of information is forgotten by the client, the EHR can serve as a repository of information on what care was provided and therefore an overview to the provider. Furthermore, the provider has access to all relevant information about the client at his or her fingertips.

Referrals to other providers are an integral aspect of providing care in a collaborative setting. The same is true for APTS, in which clients are referred to other services for follow-up care. Research on electronic referrals from an Emergency department to community clinics found a 24% improvement in frequency of follow-up for patients without primary care [39]. In this example, an electronic referral system was connected to community clinics appointment system. For clients who did not have a primary care provider, appointments were set up during client's Emergency Department visit. A client was then provided with information on their follow-up appointment to a given community clinic on the discharge instructions. This may have profound implications for clients seeking help in addiction services. Research indicates that some clients have difficulty following through addiction treatment referrals [40]. A system which is able to help identify individuals who need further follow up and at the same time help connect them with the right resources can have an impact on timeliness of care they receive [41]. Studies which examined the impact of the EHR on identification of smokers found that the EHR was more effective in

reminding physicians about asking clients about their smoking status and subsequently offering treatment [42], with 78.4% identified post EHR versus 71.6% in one study [43].

As previously discussed, the processes of data collection within ASsist database require data entry as free-text, to a large extent. Research evidence argues that free-text is a most natural method of data entry for many health practitioners, as it facilitates non-linear thought processes involved in medical decision making [44]. An electronic health record however requires that a particular pathway be followed in the data entry and retrieval [45].

Although tools have been developed to facilitate processing of free-text based electronic systems [44], these systems often require additional processing by humans or computer based expert systems. These computer based expert systems have 70-90% accuracy and require additional involvement of human to complete the process, however specialized training data sets are required to reach accuracy of that level [44]. This additional processing is performed to code data for easier processing, sharing and extraction of that data [28, 46].

One of the reasons for a systematic approach to collection and cleaning of data in EHR is that data is inconsistent because humans are chronically inconsistent [47] in their definitions of terms of diseases – multiple names for the same disease process (Atherosclerosis and Coronary Artery Disease are the same) and medical knowledge and terminology evolves over time [17, 44, 47].

A more robust approach to encoding data captured in an electronic system is coding of data using existing standards. Although information in ASsist is captured through pull-down menus for frequently entered items, the options available are not drawn from existing standardized coding systems. Classification exists to allow for a systematic placement of concepts into categories or classes, which share some common attribute, quality or property [17]. A given concept or object can be classified in an infinite number of ways and be described with synonyms. Within the healthcare setting, given the need to standardize reporting of diseases worldwide, yet in the early 19<sup>th</sup> century, the World Health Organization developed International Classification of Diseases coding system [48]. Currently this coding system is in its 10<sup>th</sup> revision, ICD-10. Additional classification systems are available. One of the most robust classification systems is SNOMED-CT (Systematized Nomenclature of Medicine – Clinical Terms), which boasts 350, 000 defined terms of clinical terminology [49] and can code for diseases, procedures and treatment.

The importance of a robust dictionary of codes available within an electronic health record system is underscored by what information is contained in the data. With each area of health services being unique – having its own distinct terminology – classification systems become increasingly important.

While much research on the EHR is done primarily in the acute care setting, some work is recently underway for addiction services. One Irish study developed a framework of EHR for MMT service [49] using international standards, including SNOMED-CT as a vocabulary. Their findings indicate that despite MMT service being a specialty, EHR can become an integrated solution in care delivery.

Given that each specialty has its own set of requirements for EHR and the multitude of vendors that provide EHR solutions [29], it is imperative that each system is able to communicate in a universal

language or be interoperable. While there are two main standards, HL7 and openEHR [17, 45, 49], ASsist does not meet either of these standards. Feedback collected from APTS staff indicated that information on medical history and mental health of their clients is important to them. Research also indicates that addiction goes hand-in-hand with other mental health problems [50]. Since ASsist is a standalone system and does not “talk” to other systems it is of paramount importance to enable seamless exchange of data between repositories of health information.

## 9. Conclusions

The internship at APTS proved to be a valuable learning experience to the author and allowed to apply knowledge and skills obtained through the Master of Health Informatics program. Some preliminary conclusions drawn from the experience are:

- Conducting a study using health information data is very time consuming when extracted data only contains fragments of client information. Each query result obtained from ASsist had to be analyzed by the author in great detail, before linking of data could occur. Despite these challenges, APTS is now better aware of the types of information that they are able to extract from ASsist database and use in future service evaluations.
- Research findings from the MMT service study demonstrate some correlation with literature, which reaffirms the process and results found.
- Documenting information and work flow for an organization requires coordination with multiple stakeholders and is time consuming. This process is beneficial in helping the organization record what processes currently look like for each service, find inefficiencies and areas of improvement.
- Soliciting feedback from staff on existing work processes and their IT needs was a tremendous opportunity at understanding that information technology is an important asset in their work. The quality and type of information available to them impacts how they are able to provide care to their clients.
- The EHR leverages significant benefits in improving quality of care provided. The present gap in information, redundancy imposed on clients, and the growing need of clinical staff to have more information available to them, makes a very strong case for implementation of EHR at APTS.

## 10. Recommendations

The MMT service study using ASsist data will serve as an example of the type of information that is currently collected and can be analyzed. A more robust solution which will benefit both the client seeking services and the clinical staff is an Electronic Health Record. Implementing the EHR at APTS would not only allow staff to view the latest information collected on a client, but also foster a more collaborative environment in how the information is generated and used to help client progress through the continuum of care.

The feedback collected from clinical staff on their IT needs and the result of preliminary discussions with CDHA IT services, indicate that both long-term and short-term goals can be identified. These are:

**Short term:**

- Define a set of information requirements for intake and registration so information collected at first point of client's contact contains all relevant data. This will assure that fields currently not identified as required in ASsist, but which are considered important, will capture necessary information.
- Provide refresher sessions to APTS staff on what data must be captured and what is the minimum expected level of detail for each item.
- Staff who refer a client to other APTS services should complete an intake for the client, time permitting, alternatively investigate with the Department of Health and Wellness if:
  - re-populating of new intake could be done using data collected recently and allowing staff to change/update necessary information
  - multiple service registrations can be attached to single intake
- Ensure that all APTS staff who require access to information contained within CDHA IT solutions (Horizon Patient Folder) have access and are trained to use it
- For clients referred from a service A to service B, investigate if arrangements can be made at service B to contact client and remind them of appointment or in case of long waitlists, when service B is available

**Long term:**

Brief discussions with Mr. Ashwin Kutty from Capital District Health Authority Information Technology services indicated that Addiction Prevention and Treatment Services is one of the three services still not integrated with CDHA enterprise solutions framework. However, there is a strong willingness to help APTS become a part of CDHA IT services.

- Obtain support and cooperation from both CDHA IT and APTS services
- Ensure that the new IT solution supports a wide variety of functions and features and allows the system to be scalable over the course of time
- Implement a solution that is interoperable with other CDHA IT infrastructure to prevent duplication of data
- Ensure a robust information technology solution is available and addresses the core requirements identified in the "must have" section (see Appendix E) before switching to the new system
- Ensure that the new solution is able to measure the existing accountabilities and best practice standards for APTS services

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## 12. Appendix A

These questions can be divided into 5 themes, those concerning:

1. Client:
  - a. Mental health and medical conditions
2. MMT service:
  - a. Length of stay in MMT program
  - b. Number of requests for MMT service before being accepted
3. Services:
  - a. Services that clients accessed prior to their first MMT admission
  - b. Service Recommendations at the time of MMT admission
  - c. Attempts of enrollment and enrollment in other services while in MMT service
  - d. Changes to services that clients accessed while being in a methadone program
  - e. Length of enrollment in other services
  - f. Does accessing more services improve Length of Stay in MMT service?
  - g. Services accessed after discharge from the MMT program
4. Relapse:
  - a. Relapses while in MMT service
  - b. Frequency of acute inpatient treatment since MMT admission
  - c. Does introduction of other treatment services post relapse improve retention in MMT service?
5. Substances:
  - a. Substances identified upon admission to the MMT program
  - b. Relationships between substances and LOS in MMT service
  - c. Substance changes between MMT admission and relapse
  - d. Substance changes between relapses
  - e. Substance Treatment received prior to first MMT admission

**13. Appendix B and Appendix B-1 - please see below**

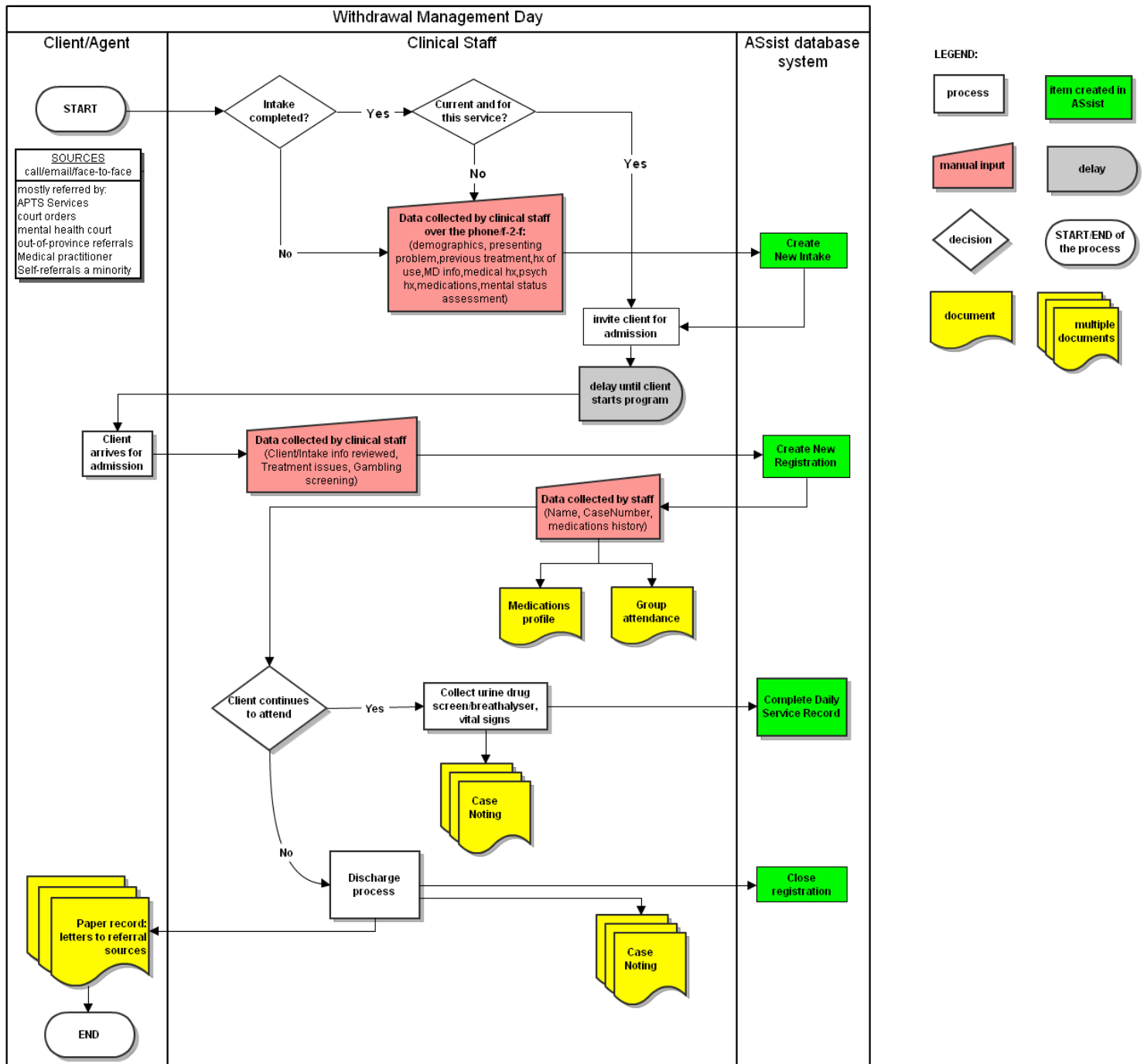
Since Appendices B and B-1 contain confidential information they are not included in this publicly available document.

## 14. Appendix C

Questions re: Patient & Information flows, ASsist evaluation and IT needs

1. Patient flow - how do potential clients
  - a. enter your services
  - b. progress through your service
  - c. exit your services
2. Information flow
  - a. What is collected?
  - b. By whom?
  - c. How is it collected?
  - d. For what purpose?
3. Do you use ASsist in your work?
  - a. In what way does it help you
  - b. How does it impede your work
4. If you could use a completely electronic health record, what would be:
  - a. Must have's
  - b. Nice-to-have

### 15. Appendix D



The information and work flows for all 5 services can be downloaded from

<http://web.unbc.ca/~simonp/Internship/InternshipAPTSFlows.xls>

## 16. Appendix E

### Overview

The discussions involved the following five service areas of Addiction Prevention and Treatment Services:

- Withdrawal Management Inpatient – a 24-hour hospital-based residential service for clients requiring medical detox
- Withdrawal Management Day – a day service providing education, counseling, and care to individuals who completed withdrawal or may be experiencing mild to moderate withdrawal.
- Structured Treatment Program – an intensive structured semi-residential program geared to clients who have already completed a withdrawal process. The focus is on providing information on addiction and its effects on many aspects of life and developing personal coping skills in a professionally-facilitated setting
- Dartmouth Community-Based Services – a community service that offers ongoing addiction treatment support and counseling to clients who have completed withdrawal and require additional supports
- Methadone Maintenance Treatment – a community based program providing treatment for opioid addiction

The feedback received from APTS staff that participated in discussions can be divided into two sections:

1. With respect to ASsist database
2. With respect to future IT needs

### ASsist feedback

Given the volume of feedback relating to ASsist, it has been divided into sections based on the themes that emerged.

#### *Benefits*

The breadth of feedback provided indicates that users were able to identify very few benefits of the database as it relates to their work and client care. These benefits included:

1. Staff rely on ASsist to view a brief history of admissions to Addictions Services across the province
2. Can identify what substances client presented with previously, but not always the amount of use due to inconsistent data entry by staff
3. When investigating the whereabouts of a client who did not show up for a scheduled admission, it is only possible for staff to see if client was admitted to another unit within Addiction Services.

### *Drawbacks*

This section is divided into four areas: relating to client care, the ASsist database, workload, and that relating to integration of ASsist with other services.

1. Client-care:
  - a. Clients are required to complete multiple intakes to the same service as well as when moving between APTS services although relevant information may have been recently collected
  - b. Although staff can see their case-load, scheduling is not available on ASsist
  - c. Duplication of information collected on intake and registration screens
2. ASsist database:
  - a. User system timeout is too short
  - b. No clear procedure/protocol exists on how and what information is entered leading to problems of data quality and consistency
  - c. No spell-checking available impacting data quality
  - d. Ambiguous definitions relating to tasks performed by staff during client care which are available to all service areas rather than task options filtered for specific areas. For instance “Initial Assessment” is displayed to all APTS services but can only be used by the Withdrawal Management Inpatient
  - e. Unable to collect and save partial information for any of the processes. With respect to intakes, when clients hang up but call again later, the information collected during the first call cannot be saved and re-used/updated later
  - f. Items that should be required are not and vice versa. For instance, when recording treatment issues at registration, generally the treatment issue number, the treatment issue type (substance/gambling), the substance and the frequency are entered. The screen can be bypassed by entering only a number into the treatment issue number. This leads to issues with data quality.
3. Work-load:
  - a. Unable to meet imposed expectations of recording all client-specific care given. Not all processes that a staff member does are reflected within available definitions of tasks. For instance, the clerical task of medication transcription cannot be captured presently, although it is a significant portion of work for some.
4. Integration with other services:
  - a. No integration of information with any other system within CDHA such as the pharmacy, lab, STAR, or Horizon Patient Folder
  - b. Some clients who have a mental health diagnosis and history of psychiatric treatment are utilizing services in APTS. None of the information from Mental Health is viewable without Horizon Patient Folder access

The consulted APTS staff identified what they saw their future IT needs to be. The themes were divided into sections of “must-have’s” and “nice-to-have’s”.

1. Must have’s
  - a. Case noting
  - b. Provide means to track clients referred internally
  - c. Manage waitlist for own service and view waitlist for other services of APTS



- d. Spell check with medical terminology, scheduler of clients and groups
  - e. Capture day-to-day work relating to client care, such as urine drug screens, medication administration, brief interactions with clients
  - f. Allow for aggregate display of data, such as viewing multiple results (e.g. urine drug screen results)
  - g. Allow for a seamless flow of chart and viewing of data (including case notes) between admissions to a given service and between different services
  - h. Comprehensive drug use history on intake with pre-defined treatment issues/substances by default with option to add “other” instead of free text.
  - i. Provide ability to collate/compare treatment issues history between admissions
  - j. Eliminate redundancy of multiple intakes for same service/between services
  - k. Allow referrals from within APTS to other services from currently active registration/intake
  - l. Frequent auditing to assure that records are not opened by unauthorized users
  - m. Allow for re-editing of saved data with added security of access logs. Often clients, whose intake/registration was just closed due to absence, show up a day/a few days later for service
  - n. Greater access to CDHA information from all health services
2. Nice-to-have
- a. Allow secure communications for referrals between services. This is currently done via phone/email.
  - b. Allow information to be viewed in tabs, so can switch back and forth
  - c. Provide grouping of admission record by service area with headings instead of long chronological list
  - d. Provide reporting capability to front-line staff on:
    - i. Averages wait-times, number of clients, common problems reported
    - ii. Satisfaction surveys/outcomes surveys
  - e. Easier work time capture:
    - iii. Calculating time of interaction automatically based on length of intake/registration and asking user for confirmation
  - f. List of outstanding assessment items that must be completed or be re-done listed on client screen as a visual cue
  - g. Brief profile of assessments completed to date to avoid duplication. This is also true for Outcome Monitoring System. At present status of OMS is recorded for each service within registration, instead of one global indicator on client profile
  - h. Automated discharge letter/summary generation for third parties when client is discharged