

NIHB Pharmacy Surveillance System Implementation of the SAS® Fraud Framework for Health Care

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ABSTRACT

This paper provides insight from implementation leads from SAS® Professional Services and Health Canada's Non-Insured Health benefits (NIHB) program, on a joint implementation of SAS® Fraud Framework for Health Care. We will walk through the fast paced implementation of NIHB's Pharmacy Surveillance System that guards Canadian taxpayers from undue costs, and protects the safety of NIHB clients. We will blend project management and technical material from both the client (NIHB) and consultant (SAS) perspectives throughout the story. We conclude with several core principles needed to successfully deliver analytical solutions.

INTRODUCTION

The Non-Insured Health Benefits Program is Health Canada's national, medically necessary health benefit program that provides coverage for benefit claims for a specified range of drugs, dental care, vision care, medical supplies and equipment, short-term crisis intervention mental health counselling and medical transportation for eligible First Nations people and Inuit.

NIHB has over 925 thousand eligible clients who may receive service through a network of 25 thousand benefit service providers (pharmacies, dentists, etc.). The Program had encountered cases of fraudulent and inappropriate billings which precipitated the implementation of the Pharmacy Surveillance System (PSS). While the main focus was addressing issues of fraud and abuse we recognized the need to expand analysis of our large data sets, identify and address issues of Program compliance, enhance reporting and leverage new technology to expand our abilities to meet requests for analysis.

A very rapid implementation of the SAS® Fraud Framework for Health Care followed. Success required a close relationship between NIHB and SAS®, flexibility to deal with challenges and a must succeed attitude.

SAS DELIVERY

Leonard Bernstein said "To achieve great things, two things are needed; a plan, and not quite enough time.". This project was a testament to that way of thinking applied to analytics. The broad project requirements, coupled with a very aggressive schedule made the solution delivery extremely challenging. Proper planning, setup and goals were key to success; no time could be wasted duplicating or redoing work. The following sections delve into how we structured the project to make the most efficient use of resources, and how we achieved a successful outcome.

PROJECT GOALS

By already having a deep understanding of the client, we had knowledge of the team and the data. Combined with information from the bid process, we were able to define the following key delivery goals:

- Avoid scope creep at all costs - no time for extra's
- Simple for end users as some users had limited knowledge of SAS®
- Data Warehouse structure must support the reporting and analytics in as simple a manner as possible
- Analytics and investigation interfaces must be able to be visualized and trusted by end users to identify audit candidates

We leveraged many agile principles, such as constant reprioritization and daily stand up meetings in order to keep our team focused on the key goals.

PROJECT TEAM

One of the key areas to plan is around the project team. It is important to have as many resources as possible in order to speed the delivery along, but we must avoid significant overlap or dependencies. Too many people can have a negative impact on the ability of the team to deliver. We identified the following roles were required for the project:

- Project Manager
- Team Lead
- Deployment Specialist
- Analyst
- Analytics Developer
- DI Developer
- BI Developer

On the Health Canada side, we were very fortunate to have a full complement of supporting roles. These roles were:

- Executive sponsor(s)
- IT Resource
- Project Lead
- Biostatistician
- Analysts
- Audit Manager
- SAS Developer

PROJECT PHASES

Matching up the key roles, we identify these distinct project phases:

- Data acquisition, profiling, and data quality planning
- Conceptual/Logical/Physical Modeling
- Data Warehouse (DW) build with SAS® Data Integration Studio
- BI Reporting
- Analytics and Alert Generation Process (AGP)
- SAS® Fraud Framework User Interface Development
- Cleanup and standardization

It is extremely important that you don't get tied to the notion that resources need to fit cleanly into the buckets. Making use of all of the skills your resources have is very important. Almost everyone on the team had some level of data integration and transformation skills; we leveraged that to push through the critical path of the project, the DW build. This gave everyone a great degree of familiarity of the data when it came time to perform their primary role.

One often overlooked topic with analytic deliveries is that of cleanup and standardization. All processes and code should look like they came from the same person, with the same approach and style. This phase and the associated role should be owned by only one person, the project lead. Successful completion of this process eases all maintenance and enhancement activities going forward.

SOLUTION DELIVERY COMPONENTS

There are several key components to the solution, the foundation of which is one common source of data within a data warehouse. The following sections go into detail on each of the components of the solution.

Data Warehouse

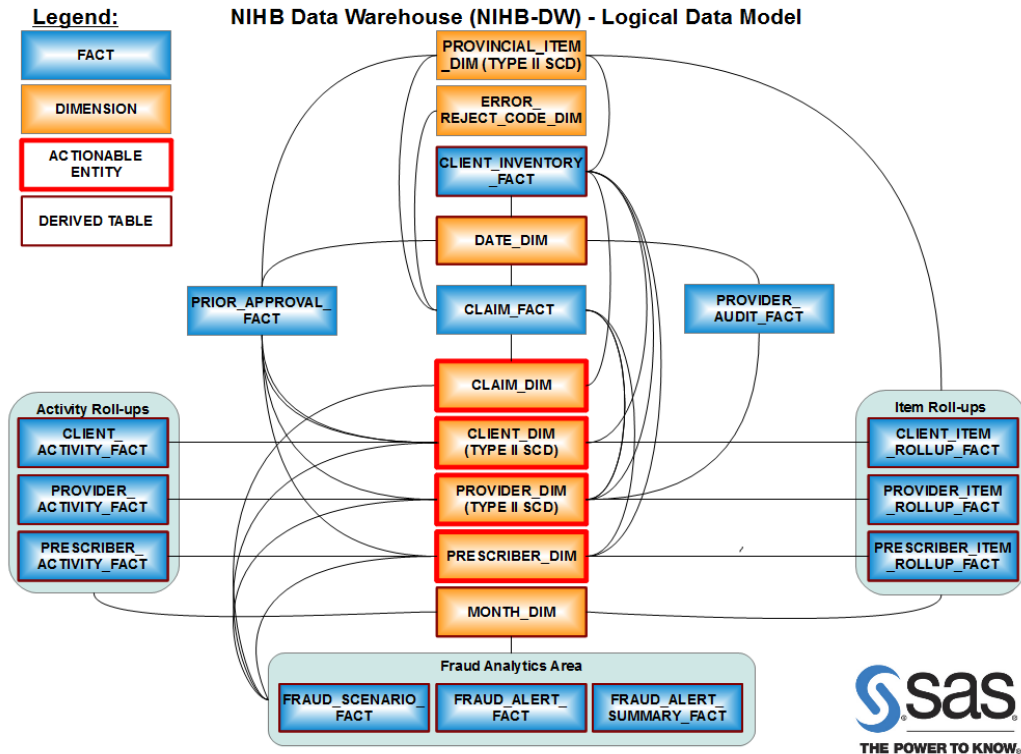


Figure 1. Logical data model for NIHB Solution

As the foundation of all other components, the data warehouse is by far the most important deliverable within the project. We leveraged the Kimball's star-schema based methodology for modeling the data structure within the warehouse. A few key attributes of the warehouse were:

- Simplified model with only 3 base Fact tables and 7 dimensions
- Pre-aggregated activity and item based fact tables
- Client inventory has a daily snapshot view of a clients' "Medicine Cabinet"
- An integrated fraud analytics area stores the output of the Alert Generation Process (AGP)

BI Delivery

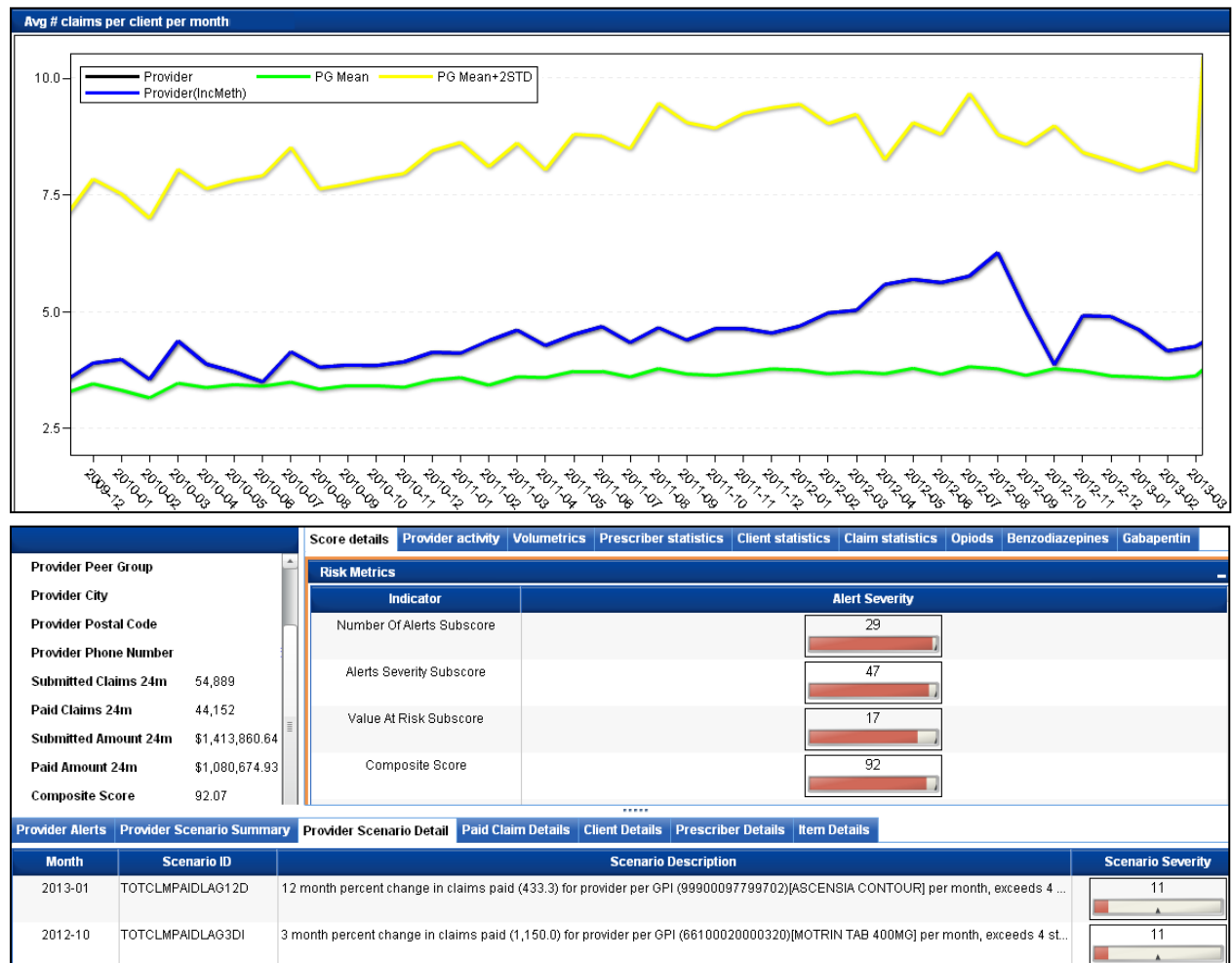
A number of out of the box reports were included with the solution, but needed to be adapted to NIHB's particular data and business paradigm. The reporting fell into 2 categories. Overall program reports show information about how the program is being used, by who and how much is being spent. The second type of reports show high level patterns and trends in specific fraud scenarios generated by the Alert Generation Process (AGP). Additionally, they show workflow status and effectiveness of compliance activities.



Display 1. SAS Portal interface displaying a web report

Investigators User Interface

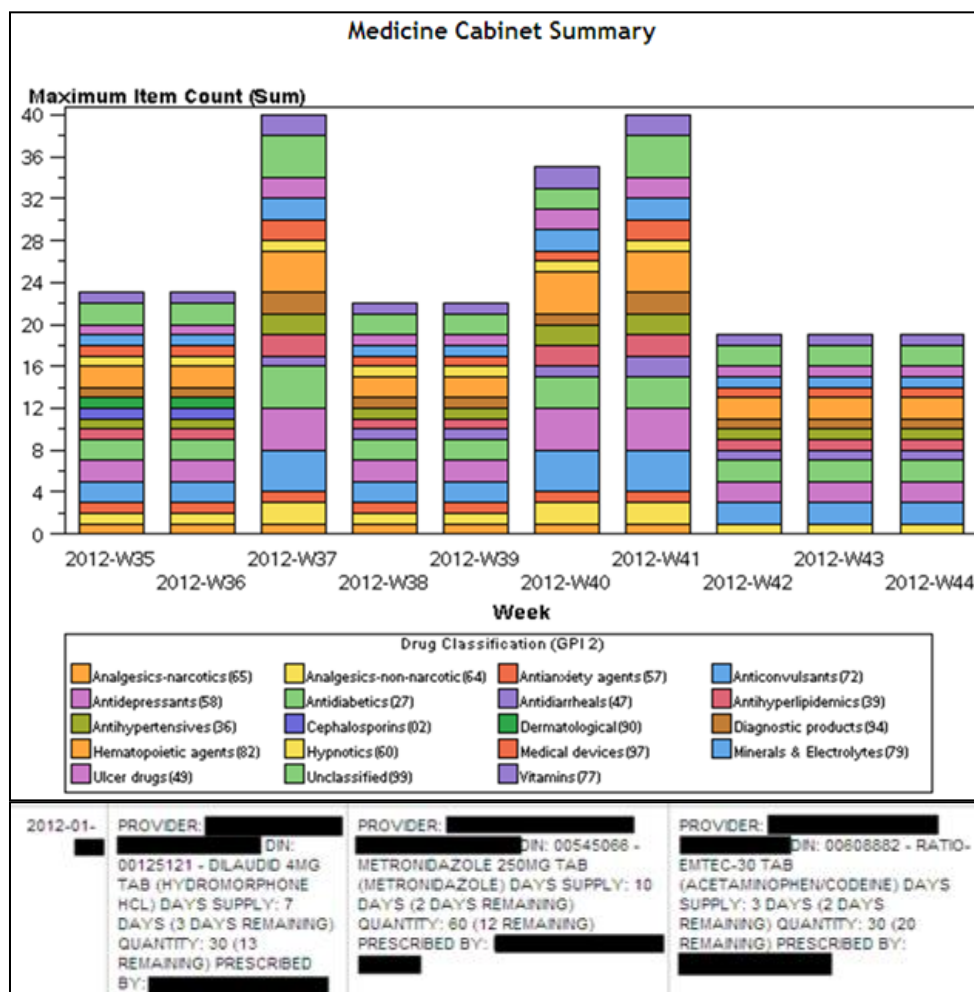
The investigator user interface is the primary tool for consumption and investigation of fraud analytics. It prioritizes alerts and provides search capabilities. The goal is to bring a 360° view of an entity to determine the “if, what, when, and where” problems exist. It also needs to capture notes and actions to be taken on the entity.



Display 2. Social Network Analysis investigative interface

Client Medicine Cabinet (Inventory)

At the end of the project, a client inventory view was developed at the end of the project as a bonus. It has a multitude of promising applications including client/prescriber/pharmacy fraud scenarios, client safety, and client condition modeling, assessing impacts of drug shortages, drug interactions, early refills, etc. It can also help determine abuse or fraudulent use of opiates or benzodiazepines by calculating total morphine or benzodiazepine equivalence units per day (available in the DW).



Display 3. Medicine Cabinet Report

Alert Generation Process

The Alert Generation Process utilized SAS® proprietary rules and algorithms packaged for the SAS® Fraud Framework for Health Care solution. Because the goal was to identify audit candidates versus individual scenarios, a composite score was developed with a hierarchical roll-up structure:

- Scenarios – A triggered individual event at any point in time with a weighting or severity score
- Monthly Alerts – Severity score rolled up scenarios to a monthly severity score with a minimum threshold
- Alert Summary - composite score of average severity, number of alerts and billing amount for past 2 years

DELIVERY CHALLENGES

Throughout the solution delivery, the team had to overcome many obstacles and challenges. The following lists a few of the main issues we encountered through the project:

- Inaccurate and incomplete data dictionary from 3rd party claims processor
- Delays and challenges in acquiring data
- Delays in the provision of development environments resulting in the continual resetting of the project schedule
- Need to develop a fully integrated data model
- Alert Generation Process code was U.S.A. industry based and required significant changes for Canadian based data
- So many rules were available out of the box, that it was difficult to understand and prioritize all of them

TECHNICAL OUTCOME

Despite an aggressive timeline of less than 4 months, timelines for project delivery were met. The data warehouse, which was built & hosted entirely in SAS® 9.3 (using SAS® Data Integration Studio) is a huge success and leveraged daily. The clients were able to easily understand the structure right away despite limited technical knowledge of SAS®, and created useful queries with SAS® Enterprise Guide in minutes without help. The innovation of Client Inventory (“Medicine Cabinet”) has been very useful, and has been used in a wide range of applications outside of fraud (i.e. client safety).

GUIDING PRINCIPLES

The success of this project was in large due to the following guiding principles. The rules are not absolute, but rather used as a compass to keep the project going in the right direction.

Simplicity

Albert Einstein said “Make things as simple as possible, but not simpler.”. Keep to the minimum scope that can add value to the client, as not all solution features must be implemented out-of-the-box. Focus on the features which will drive initial value, de-prioritize things that cannot be leveraged right away even if they are sexy or cool. Don't forget about the sexy stuff, try to get a little bit of it in at the end, as this is what will get the client raving about the solution.

Keep in mind that active executive sponsors are always a key success factor, but they can lose attention quickly; you need them to advocate and facilitate on your behalf (i.e. with other departments or IT). Client value must be delivered in 3 months or risks go up exponentially as business priorities are constantly changing. You don't want your project to be the one that gets cut.

Data

Ralph Kimball's Dimensional Modeling methodology is fantastic for both BI and analytic delivery. Reporting structures (OLAP cubes or Visual Analytics) can be run easily on top of the star structure saving valuable time. Extracts for rules and models are extremely simple. A solid data warehouse foundation will ease analytical and BI deliverables.

It is also very important to solve data quality issues early in the project and early in the process, to avoid duplication and other problems. Always make sure to set aside enough time at the start of the project to properly build out the data environment; everything else is simple if the data is good.

Some other data tips and tricks include; using SAS Formats wherever possible; leveraging sort order, as it can play a big deal in optimizing certain types of queries. Furthermore, don't wait until the very end to optimize performance; it pays dividends throughout the project with reduced development, testing and bug fix time.

Prototype

Surprises in projects are rarely good, so it is important to get them out of the way early. If at all possible prototype the whole solution from end-to-end, this will validate the deployment and overall solution architecture. Never throw away prototypes unless the architecture was a mistake. Showing your client the prototype to get feedback on the design is a great idea, but don't forget to caveat the early showings. Those early client feedback sessions can have the added benefit of helping to convince clients of the merits of a controversial design decision or clear up misconceptions about the design.

NIHB IMPACTS

DATA WAREHOUSE

The NIHB Pharmacy Data Warehouse (DW) is the foundation of the PSS, with all other components accessing it. The DW contains historical data relating to all transactions of NIHB Programs pharmacy claims. The data includes information on over 100 million claim lines, 930 thousand eligible claimants, more than 10 thousand pharmacy service providers and over 1 billion records of client inventory information. Prior to the implementation of the PSS NIHB relied on two systems to obtain partially complete claims information, one being a business intelligence tool for ad hoc reporting and the other a pharmacy benefit management tool. The PSS includes roll up tables and OLAP cubes that contain information on providers, benefits, clients and claims developed as part of this project. As a result, the PSS has been optimized for data exploration and analysis times have been significantly reduced.

Client safety and the safe use of prescription medications is a priority of the NIHB Program. The DW is the foundation for an innovative surveillance program, which has resulted in reduced levels of potential drugs of abuse being paid for by the Program. The PSS has been leveraged to carry out complex analyses in support of policy development aimed at addressing prescription drug abuse amongst clients.

SAS® FRAUD FRAMEWORK

The implementation of the PSS has allowed NIHB to assume responsibility for pharmacy service provider profiling, a component of the NIHB Pharmacy Audit Program that had been previously performed under terms of an external contract with the Program's claims processor. The SAS Fraud Framework enables NIHB to utilize complex analytics to compare benefit service provider activities against a relevant peer group in over 40 different scenarios that may indicate fraud, waste or abuse. The scenarios, when combined with weights, thresholds and provider expenditures generate a composite score which identifies the perceived financial risk to the Program that a specific provider's billings represent. The internal management of the provider profiling leverages 40 industry scenarios for fraud, waste and abuse which are able to be modified internally to constantly improve the results resulting in improved audit results, earlier identification of issues and the flexibility to adapt to policy change without being reliant on external resources.

All of the analyses comprising the provider profiling assessments are presented in a centralized location specifically designed to allow for the rapid assessment of a provider's activity and determine if further action is required. Supporting information including types and volumes of drugs dispensed, clients served at the pharmacy, and claims that may be of concern are all included. The automated analysis significantly reduces staff resources required to examine claims data. The amount of analyses and level of detail resulting from the PSS was not possible previously. The provider profiling improvements have created opportunities for NIHB to engage with benefit service providers following identification of behaviors of financial and professional practice concern at earlier stages than would have been done previously, a direct and positive impact on Program finances.

To do this same investigative work using the previous BI tools available to NIHB would have required dozens of queries or reports and a significant amount of time and manual manipulation on the part of the analyst. This information is now readily available and allows for analysts to carry out profiling activities rapidly and more efficiently. It also represents a genuine shift in the way pharmacy service providers are assessed for Program compliance and profiled for inclusion in the audit process.

REPORTING COMPONENTS

Reporting activities at NIHB have been streamlined through the use of a web based reporting repository made available through the PSS. Previously, reports had been disseminated to clients through email and hardcopy print. The PSS has the benefit of allowing users without a technical background to access reports, conduct pre-defined analyses, and modify query conditions as required. Dashboards and OLAP cubes are among other analyses tools accessible online to users, reducing the burden on NIHB analysts for updates and providing users with the flexibility and freedom to manage their own reporting and data requirements.

The implementation of the PSS has completely transformed NIHB's approach to conducting analytical activities. Leveraging all components of the PSS allows NIHB to carry out greater amounts of highly complex analytical work in shorter amounts of time and with fewer resources than could have been achieved previously.

CONCLUSION

The implementation of the SAS® Fraud Framework for Health Care and all of the supporting software components was a success for both SAS and NIHB. NIHB acquired new tools and capabilities to better manage the Program while SAS deployed the first instance of the SAS® Fraud Framework for Health Care in Canada. The rapid implementation challenged both SAS and NIHB and created a strong client/vendor team working relationship where all parties were successful in reaching their common goal.

CONTACT INFORMATION

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