KPI’s for intuitive, real-time health care analytics

This document presents how intuitive dashboards along with right KPI’s can accelerate the speed of and quality of decision making for health care providers.

2018

Rajashri.N

3/17/2018

Introduction:

The dynamic healthcare environment – evolving regulatory environment, shifting reimbursement models, rising consumerism and declining margins are pushing providers to adopt new technologies and go digital. The rapid proliferation of technology in providers is leading to generation of data which is versatile(EMR, Lab, Diagnostic, Images etc.,).The BI and analytic systems should gather and aggregate data against right KPIs and provide meaningful insights.

KPI Definition:

With greater accountability the providers are now defining KPI(Key Performance Indicators) to track their progress towards long and short term goals.

These KPI’s are essential factors to determine a firms success. KPI defined must be subjected to SMART test.

S – Specific

M- Measurable

A – Achievable

R – Result oriented

T – Time based

**Key Performance Indicators,**

**Increase Revenue**

Business Requirement

To increase revenue and reduce cost per procedure by improving claim accuracy and patient base retention.

Data Source

Claims reported by individuals who undergo treatments & related financials.

Business Logic

Monitor financials and diagnostic procedure that has high payments

Sample SQL Query,

SELECT pt.name AS "Patient",

p.name AS "Primary Physician",

pd.cost AS "Procedure Cost"

FROM patient pt

JOIN undergoes u ON u.patient=pt.ssn

JOIN physician p ON pt.pcp=p.employeeid

JOIN PROCEDURE pd ON u.procedure=pd.code

WHERE pd.cost>5000;

Constraints

The financial format provided by the suppliers are different. Sometimes the data is of implicit decimal format or implied decimal. This should be set up appropriately.

Visualisation Requirements

Summary of financials by procedure undergone on a monthly basis.

**Patient satisfaction & turn around**

Business Requirement

To have reduced waiting times, high occupancy rate, Bed turnover rate, Care giver to patient ratio, staff quality.

Data Source

1.Medical Practitioner

2.Patient profile

3.Facility information viz-a-viz Medical equipment’s, Bed, Nursery Room etc.

Business Logic

1.Monitor treatments undergone by patient, how can we keep them informed about their appointments like sending alerts a day before his appointment.

2.Auditing facilities frequently.

3.Deploying right mix of registered nurses and doctors.

Sample SQL Query,

SELECT p.name AS "Patient",

y.name AS "Physician",

n.name AS "Nurse",

u.date AS "Date of release",

r.roomnumber AS "Room",

r.blockfloor AS "Floor",

r.blockcode AS "Block"

FROM undergoes u

JOIN patient p ON u.patient=p.ssn

JOIN physician y ON u.physician=y.employeeid

LEFT JOIN nurse n ON u.assistingnurse=n.employeeid

JOIN stay s ON u.stay=s.stayid

JOIN room r ON s.room=r.roomnumber;

Constraints :

1.Room data comes in the form of codes and hence it has to be looked up with appropriate descriptions.

Like – N – Nursey, R – Rehabilitation etc.,

2.Patient could be an enrollee or a dependent, this should be determined by the employeeID and other SSN tied to it.

3.SSN should be a non null field.

Visualisation Requirement :

Daily report on facilities like Rooms available, patients handled by physicians and/or nurses, discharges made per day.

Next Steps:

Once we have identified the KPI ,we have to chalk out a plan that helps providers to Monitor and improve processes.

The diagram below shows the phases in the next steps

Analytics and BI tools

Most providers in the industry have ERP’s and multiple other tools for their analytic needs. Evolving health care industry needs analytic solutions that are unified and caters for a variety of needs. The following flow diagram shows the incremental steps to achieve this vision.

High Level Scope

Depending on the requirements of the business we deploy and architecture which is scalable ,reliable and most importantly secured.

Since, the data is from a variety of sources like clinical records, text messages, claim files, images viz-a-viz CT Scan, MRI etc., we opt in for a Hadoop framework with mapR.

Hadoop is built to process large amounts of data from terabytes to petabytes, and beyond. It delivers greater business impact when used as part of the MapR Converged Data Platform. The MapR Platform combines operational and analytical workloads that drive business insights in real time that are not feasible in other environments that suffer from complex integrations between disparate data silos.

Logical View

The MapR Converged Data Platform enables direct processing of files, tables, and event streams. Unlike "connected" environments that require complex integrations and orchestration, convergence offers a streamlined architecture that enables **real-time insights**, a **consistent security** framework across compute engines, **higher resource utilization**, and reduced administrative overhead.

**Constraints :**

**Security and privacy**

Health data reveals most sensitive information about an individual and his health condition. Security and privacy is of prime concern when dealing with these forms of PHI viz-a-viz **info graphics** related to a person ,his **demographics** and his health related information including but not limited to his **diagnostic procedures and ailments.**

**Scalability and reliability**

Scalability and reliability of the underlying physical implementation. Since we will be dealing with enormous amount of data which in itself comes in at different variety, needs to be handled in an efficient manner and with greater reliability which accounts for any mishap to data which could be reverted when there is a mirroring.

**Data Access**

With Hadoop framework in place we need not worry about the data retrieval and performing analysis on the big data sets.We use mapR file system in our physical implementation with Hue for data visualization.