Business Description

Precision medicine holds the promise too drastically improve medical care in the near future. Doctors could better serve patients if they knew what treatments and medications work best for an individual and what diseases they are at risk of developing. Genetic testing is the tool that is bringing this dream into a reality. Whole genome sequencing costs have been dropping over the last decade. To the point where it is becoming feasible for all patients to know their personal genome. The slower and more complex issue that is still holding back the industry is finding the knowledge that is contained from each uniquely esoteric genome. Progress must be made in understanding how genes, or more accurately gene clusters, effect or cause disease. Also, wellness factors could be better understood for individuals to optimize their diets, sleep schedules, and activity levels.

Businesses that want to operate in the field of precision medicine will have to be able to manage large amounts of data. Good database design is imperative. To illustrate this point, we will construct a database for a theoretical company: Styx Genetics. Styx Genetics will offer a clinically approved and insurance covered test, the Crystal Ball test, for pediatricians and parents of newborns who want to be able to provide the best care and nurturing. This cutting-edge test will provide risks scores and wellness factors that are derived from a new technique of analyzing genomes. To be able to provide accurate reports a single relational database that incorporates a LIMS (Laboratory Information Management System) must be built. LIMS will track samples through processing to ensure patients are receiving accurate information. A basic model for genetic testing that includes DNA extraction, DNA preparation, and sequencing on Illumina instruments will be assumed.

Data Requirements

Every patient is tracked with by a unique patient ID (PID), patient name, patient parents, date of birth, address, phone number, and provider. A payment method must also be included which includes out of pocket or through insurance. If through insurance, policy number, the company’s name with its phone number and address must be provided.

Patients will be able to provide different sample types for their convenience either blood, saliva, or buccal swab. These will be tracked via Sample ID(SID). And could be required to send in multiple samples for possible lab complications. Samples will be collected with kits that have barcodes included in the packaging.

Samples then enter the LIMS system that tracks each step of processing. The first step is extracting DNA from the sample. This will produce one or more tubes of differing concentration. Then the DNA must be prepared for sequencing that produces a new container that holds DNA that is ready to be sequenced. Finally, sequencing data will be produced that is contained in a unique file. Each step must contain the instrument ID that it was ran on, it must also include the technician who ran it, and a start and end date/time for each step. The instrument ID will include type (1. Qiagen Symphony 2. SuperHamilton 8.0 3. Illumina HighSec 1000) as well as a unique identifier. The technician will have a unique ID, name, and job title.

Finally, two reports, one for a medical professional (MID) and one for the parents (PPID), will be produced. Each file will have a unique ID(RID) for long term storage at the company.