Agile Data Science at a Wearable Medical Device Company

A leading medical device company wanted to build an open data ecosystem unlocking the combined value of patient, ERP, CRM, and manufacturing data.

Silicon Valley Data Science jump-started the company's data usage by connecting internal operations data to actual patient outcomes.

Background and Business Problem

SVDS was engaged by a medical device company that provides a chronic disease monitoring solution. The client previously asked us to define the architectural foundation for their new focus on data; they now wanted to accelerate the extraction of key business learnings from the data.

Our client sought to unlock the data locked in various silos, including devices, ERP, SFA, complaint management, and manufacturing. A series of investigative charters were identified in order to better understand the following:

- how patients acquire and use the client's device
- the overall health of the patient base
- patient segmentation based on emergent physical and commercial characteristics

The client also wished to better understand current data availability while exploring and prototyping demonstrative data products. In order to do this, they needed to validate key assumptions about important data sets and begin extracting key business value from key data sets. In addition, the data sets needed to be validated for their ability to assess viability and readiness to support more complex discovery.

To focus the exploration and and define success, our client needed new technology, metrics, and analytical capabilities to monitor patient and population level data, yielding new insights into the monitoring solution's effectiveness.

The Challenge

Real-time, individual device data wasn't being used to understand population-level outcomes

Internally, functional data (CRM, ERP, manufacturing) was locked in silos

The viability and readiness of internal data sources to support more complex discovery was unknown

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Solution

SVDS began by building an initial data platform and performing exploratory data analysis. This was the first time the client leveraged population-wide user-level data to generate holistic insights across their patient base. Historically, this data had been used to serve only individual patient needs and FDA regulated interactions. The liberation of this data and the ability to integrate patient device data with other useful sources such as sales data and CRM enabled the company to better understand their users and consumption patterns based on detailed population segmentation. Additionally, the ability to use patient data in real time to denote active users, as opposed to a subset of direct purchase behavior, laid the foundation for later generating entirely new views of company-wide patient churn.

Key to unlocking these new data sets was the data platform, where we aggregated disparate data sources, enabled data exploration, and modeled results. The data platform implemented Jupyter Server in tandem with a Hadoop-based environment in order to leverage the best of the Python ecosystem (Pandas, Seaborn, scikit-learn, NumPy, etc.) in concert with Spark and Hive for dealing with data at scale.

After building infrastructure that enabled processing of patient device data for ~32K devices and 1.9m patient days of data, this data was combined with demographic and transactional data from core CRM and ERP systems. Utilizing the resulting combined data set, we worked with our client to establish a new series of metrics with a common lens and context for understanding and interacting with their customers through data. Key client benefits of this combined data set included the ability to review and compare performance of patients across key segments, including by payor. The ability to generate and visualize these data sets unlocked significant potential future work.

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PAYOR KEY OBSERVATIONS

- Payor data available for **subset of linked patient accounts**

- **Differentiation** occurs across payors in key metrics

- Data **cleanup and quality** effort needed to utilize historical payor data
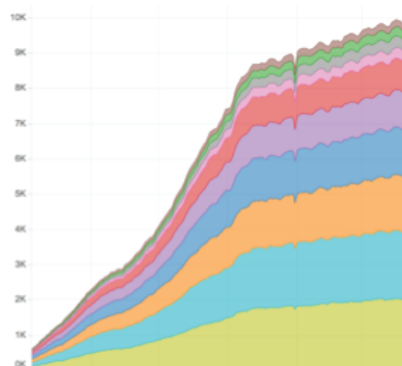
Our Approach

SVDS integrated a variety of previously untapped data sources, such as patient-worn device date and sales orders

We conducted a series of population-level explor-atory studies around patient adoption, usage, adherence, and purchase patterns

We front-loaded efforts to prove out critical, but uncertain, aspects of the solution

New Capabilities

Foundational data plat-form that enabled the exploration, integration, and visualization of cross functional and organiza-tional data

Patient segmentation on demographic, behavioral, and usage patterns

Functional and productive data science capabilities

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