

Application Note

Using Advanced Analytics for Data-Driven Healthcare Transformation

Add AI/ML capabilities to your healthcare workflows using Amorphic and AWS

Abstract

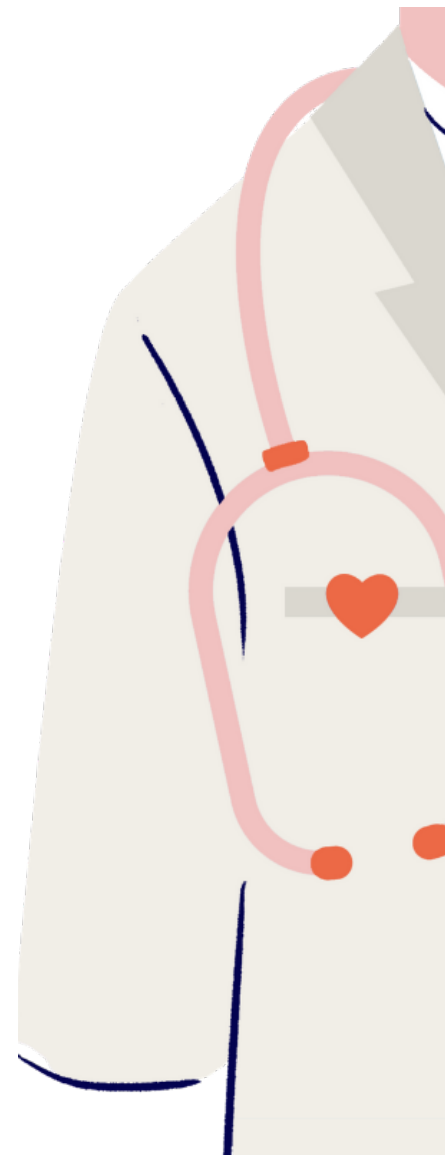
Healthcare ecosystem is looking for solutions to their toughest problems - care delivery, patient experience, and rising medical costs.

In this application note, we examine the opportunities offered by advanced analytics, and discuss its application to two problems in healthcare:

- Disease Management
- Provider Fraud detection

Problems in Healthcare

Healthcare ecosystem consists of three main entities - **Patients, Providers and Payors** - having a fragmented relationship between them. This results in Fraud, Waste and Abuse (FWA) of healthcare services leading to increased cost of delivery and insurance costs. On the other hand, patient experience suffers due to discontinuity of the care continuum in consuming healthcare services. This results in - increased hospital readmissions, increased length of stay, and increased burden on the payor.



How can advanced analytics unlock opportunities to transform healthcare?

Advanced Analytics unlocks new opportunities to transform how healthcare is delivered and consumed. Figure 1 below shows a spectrum of analytical capabilities that help in extracting business value from data.

Predictive and Prescriptive capabilities (Advanced Analytics) are powered by developments in ML and Deep Learning.

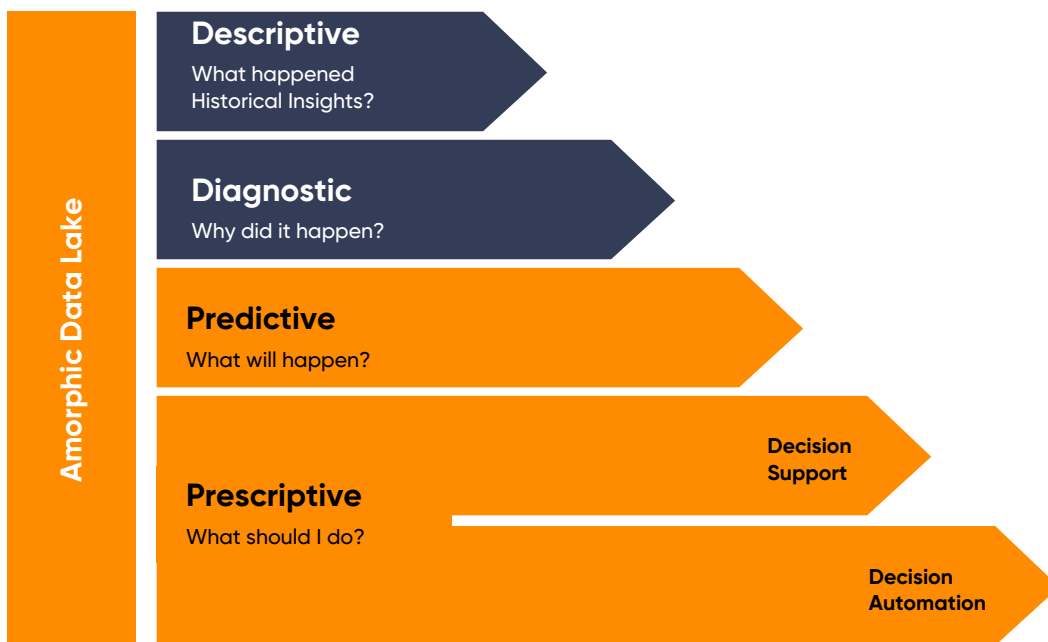


Figure 1: Analytics Spectrum (Gartner)

In the healthcare context, Advanced Analytics can be used to unlock new opportunities.

Descriptive analytics can derive insights from historical data (patient, provider, payor).

Diagnostic analytics can help in identifying sources of value. For e.g., with supervised learning ML models, healthcare-claims data from past can help in finding signals of provider fraudulent claims.

Predictive Analytics can be used to predict future outcomes for a patient or provider.

Prescriptive analytics can help in personalized recommendations for desired patient outcomes.

In a nutshell:

- Descriptive analytics can help identify "at-risk" population
- Predictive analytics can tell us which one of this interest group is likely to go down the path of an undesired future outcome

This is a powerful combination as we will see in the two use-case examples 'provider fraud' and 'disease management'.

Challenges posed by Data in Healthcare:

Building Advanced Analytics applications require processing of data from sources across patient, provider and payor. However, data sits inside organizational and technology silos across the healthcare ecosystem. As a result, healthcare organizations struggle with data integration and making the curated data available for advanced analytics. This poses a big challenge for providers and payors to leverage advanced analytics to solve their problems for improved patient care and controlling costs.

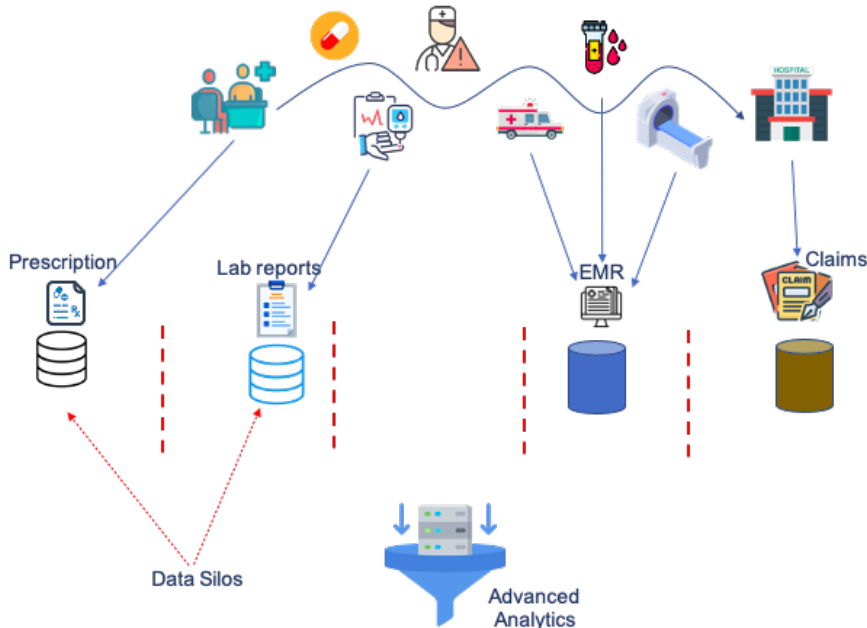


Figure 2: Data silos in healthcare

How can Amorphic Help?

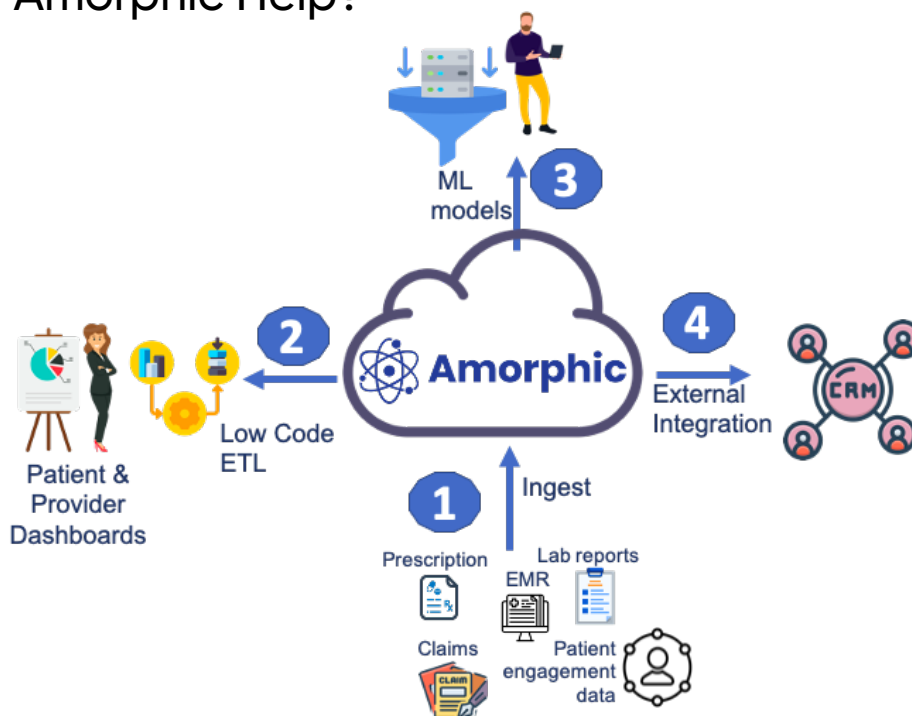


Figure 3: Amorphic for Advanced Analytics in Healthcare

Figure 3 illustrates how Amorphic helps healthcare organization build advanced capabilities in four steps:

1. Ingest and store data from all types of structured and unstructured healthcare data sources
2. Low-Code ETL pipelines for data transformation
3. Build ML models from historical and real time data
4. Egress integration with healthcare workflows to operationalize data-driven insights

Advanced Analytics Use Cases:

1. Disease Management

Use Case	Improved Engagement Rate for Disease Management Programs
<p>Customer Segment & Early Adopters</p>	<p>Payor Care Management programs End-User: Case Manager Early Adopter: Chronic DM and CCM programs @ Payor companies</p>
<p>Current State: Problems & Existing Alternatives</p>	<ol style="list-style-type: none"> 1. Patient data sitting in silos. Payors struggle with data preparation for advanced analytics. 2. Chronic Disease Management (DM) programs unable to create a meaningful impact on patient behavior. 3. Unable to identify high-risk high-need members for engagement. 4. Low engagement rates for outreach due to inadequate patient context. <p>Existing Alternative: Legacy tools.</p>
<p>Amorphic Solution</p>	<ol style="list-style-type: none"> 1. Single repository for patient journey clinical and non-clinical data 2. Automated ingestion and low code pipelines to build curated patient journey datasets. 3. Patient Journey Analytics dashboards to get member 360 view. 4. Build descriptive and prescriptive ML models from historical and real time data. 5. Tight integration with patient engagement tools to get alerts and operationalize the journey insights.
<p>Future State: Finished Story</p>	<p>Imagine you are a case manager in a payor setting taking care of chronic disease management program for diabetes. Using ML models trained on patient clinical and behavior data, you can identify a segment of patients at high risk of complications. (Descriptive Analytics)</p> <p>Using predictive journey insights, you can intervene at risk patients going down the path of avoidable medical costs. (Predictive Analytics)</p> <p>Get recommendations for patient preferred channels to maximize likelihood of engagement. (Prescriptive Analytics)</p>
<p>Unique Value Proposition</p>	<ol style="list-style-type: none"> 1. Improved patient journeys with predictable outcomes. 2. Transformed Disease Management with improved engagement rates.

2. Fraud Detection

Use Case	Healthcare Provider Fraud Detection
Customer Segment	Payor Fraud Management programs
Problem Overview	<p>Healthcare fraud and abuse takes many forms. Some of the most common types of frauds by providers are:</p> <ol style="list-style-type: none"> 1. Billing for services that were not provided. 2. Duplicate submission of a claim for the same service. 3. Misrepresenting the service provided. 4. Charging for a more complex or expensive service than was actually provided. 5. Billing for a covered service when the service actually provided was not covered.
Problem Statement	<ul style="list-style-type: none"> - To "predict the potentially fraudulent providers" based on the claims filed by them. - Discover important variables helpful in detecting the behaviour of potentially fraud providers. - Study fraudulent patterns in the provider's claims to predict the future behaviour of providers.
Amorphic Solution	<ol style="list-style-type: none"> 1. Single repository for Data Sources <ol style="list-style-type: none"> A) Inpatient Data which provides insights about the claims filed for those patients who are admitted in the hospitals. It also provides additional details like their admission and discharge dates and admitted diagnosis code. B) Outpatient Data which provides details about the claims filed for those patients who visit hospitals and not admitted in it. C) Beneficiary Details Data that contains beneficiary KYC details like health conditions, region they belong to etc. 2. Build Descriptive Analytics models from past claims to identify clusters of fraudulent claims with fraud predictors AND predictive ML models to flag if any provider is going down the path of committing a fraud.
Future State: Finished Story	<p>Imagine you work in the fraud detection and prevention department in a payor setting. Identify a segment of healthcare providers at high risk of committing a fraud. Using predictive insights, you can intervene at-risk providers going down the path of committing a fraud.</p>