

Drive Better ROI While Engaging Consumers More Effectively with Machine Learning: A Regional Healthplan ER Savings Case Study

Background

It was a year ago that Linda took over as GM of the health insurance company's regional business unit and six months since she had signed off on the multi-million dollar analytics package. In the intervening six months, the analytics team worked hard — launching dozens of programs to reduce medical costs through various consumer engagement tactics and channels. The team had a number of projects in progress to reduce emergency room overuse because it was such a visible and costly use case. They targeted everyone they could — from rural populations to expectant mothers and urban families.

However, after six months of hard work, Linda still didn't have solid answers to two simple, yet crucial questions:

1. Which plan members are driving ER overuse costs?
2. Where should the team focus their consumer engagement efforts for the highest ROI?

Despite launching dozens of consumer engagement programs, the team's "spray

Pinpoint 60% of ER overuse costs by targeting only 20% of members to sharpen program decisions.

and pray" approach to containing medical costs wasn't working.

But what if Linda's team could pinpoint 60% of ER overuse costs by targeting only 20% of members? What if they knew which members were likely to drive up costs? Her team could both save money on program spend and reduce ER overuse costs at the same time.

While Linda's story is an example, it mirrors what many healthplan executives are facing every day. To put a spotlight on how healthplans can arrive at new results by approaching their analytics differently, NextHealth analyzed data from a leading regional insurer with \$25 million in quarterly ER costs.

How it Works

NextHealth analyzed first- and third-party data from 232,750 members using advanced algorithms. The analysis looked at all members including those who previously used the ER and those who had no historic ER use. The analysis was designed to provide clarity on which members were likely to overuse the ER and which members were likely to drive ER overuse costs. The analysis was designed to predict both ER use and ER costs.

Making big data smarter

Two types of data were analyzed: first-party member medical and pharmacy claims data from the healthplan; and third-party demographic, location-based and behavioral data. The NextHealth team organized and structured the data to make it ready for analysis and insight, turning otherwise static and 'dumb' big data into dynamic and 'smart'

big data. "Combining first- and third-party data this way created rich member profiles that were more predictive of future behavior," said Dr. Doug Popken, Senior Vice President of Analytics for NextHealth Technologies.

Deploy advanced algorithms to pinpoint members and drive impact

NextHealth then used the transformed data to train machine learning models, such as Random Forest and Gradient Boosting models to create member-level predictions and answers to the core question of which members were likely to incur ER costs. NextHealth's use of such advanced algorithms complements internal analytics efforts because many internal teams are just beginning to use such algorithms, if at all. As a result, NextHealth is able to unlock insights in member data hiding in plain sight by using such advanced analysis techniques.

Figure 1: ER Cost Prediction Cumulative Gains Chart

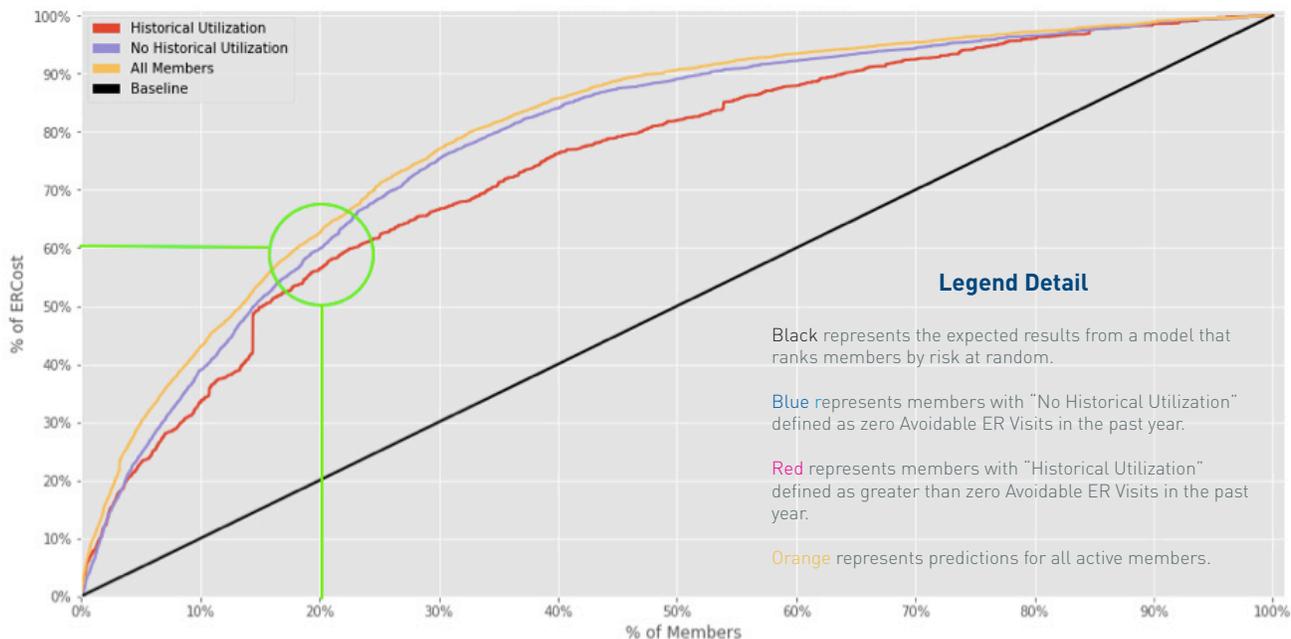


Figure 1 summarizes the accuracy of the NextHealth ER cost predictions across three scenarios: all members, members with prior ER utilization and members with no prior utilization. The chart compares cumulative actual ER costs to cumulative predicted costs.

The green circle highlights the NextHealth predictive analytical model results where the top 20% of members, ordered in terms of risk according to the predictive model, account for 60% of the total actual ER costs for the entire population. A steeper curve represents a

more accurate prediction. The black line is the predicted result from a random, “spray and pray” approach.

“An insurer that targets just the top 20% of members according to NextHealth’s predicted risk would actually target a much higher number of people who use the ER than when deploying a random approach,” said Jeremy Schendel, Senior Data Scientist at NextHealth Technologies.

By using NextHealth’s predictive model an insurer can capture 60% of the ER cost in the population by targeting only 20% of the population. This leads to a much higher ROI for each dollar spent on outreach to members when trying to lower ER costs.

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Two Powerful Findings

In the case of the regional insurer, applying advanced algorithms to rich data sets built on first- and third-party data uncovered two powerful findings.

1. Predictive analytics improves ROI

Many insurers have honed their descriptive analytics skills to clearly show what has happened in the past. While retroactively insightful, predictive analytics go a step further to forecast who is going to use the ER in the future. This ability to accurately predict future outcomes drives ROI because an effective predictive model enables the identification and engagement of far more members who drive ER costs than either a random approach or purely descriptive model.

A very small percentage of members utilize the ER in a given quarter (roughly 4.5%) and pinpointing these members is quite difficult. Considering that such a small number of members utilize the ER, the random approach nets fewer members who utilize the ER than a good predictive model, allowing insurers to more effectively find the needles in the haystack.

2. Business leaders can proactively pinpoint and impact, hidden ER cost drivers

Many analyses focus on high risk segments exhibiting previous ER overuse behavior. Such analyses overlook those members with no prior ER use who do exhibit other predictors of likely future ER costs. By structuring and analyzing first- and third-party data using advanced algorithms, NextHealth is able to provide clients with clarity on which specific members are likely to drive ER costs, regardless of prior ER use.

The NextHealth model is equally effective at predicting ER utilization for members with and without historical utilization (the red and blue lines in Figure 1 are nearly identical). The model is able to extrapolate the behavior patterns that lead to ER overuse, even before an initial ER event has occurred.

Investment Implications

Healthcare insurers can drive new insights from data they already have to reduce medical costs at scale.

- Advanced analytics prevent a spray and pray consumer engagement investment approach.
- Advanced analytics enable executives to target the small percentage of members who drive significant costs.

Go beyond insights to Know What Works™. NextHealth’s analytics platform measures and optimizes health plans’ clinical and consumer program spend to drive faster and better business decisions, reduced costs, and improved outcomes.