CASE STUDY

$15 MILLION INCREMENTAL REVENUE WITH AI/ML ENABLED PATIENT ADHERENCE

USING MACHINE LEARNING (ML) ALGORITHMS TO IDENTIFY HIGH-RISK PATIENTS, DESIGN INTERVENTION PROGRAMS, AND SIGNIFICANTLY INCREASE DRUG ADHERENCE.

Specialty Pharmacies (SP) are reliable distribution channels for expensive drugs, offering patient convenience and cost benefits, while maximizing insurance reimbursements from those payers that cover the drug.

INTRODUCTION

For a pharma company, poor drug adherence is one of the most significant concerns for achieving positive patient outcomes. Suboptimal treatment adherence is associated with many risks beyond the existing diseased state. With approximately 125,000 deaths, low adherence costs in the US health care system ranges between $100 billion and $300 billion annually, according to a study by the Annals of Internal Medicine[1]. The same study reported that the prescription adherence for chronic diseases is about 50 percent, with around 20-30 percent of prescriptions never being fulfilled[1].

PATIENTS NON-ADHERENCE

Patients usually drop out of prescribed treatment plans due to reasons like

- Misinformation about the impact of non-adherence
- Fear of side-effects
- Delayed relief from medication
- Affordability
- Societal pressure for self-healing

To overcome these factors, pharma companies continually design and implement patient intervention programs, at the time of discharge and for outpatients, to enforce compliance discipline if needed, and adherence to prescribed treatments. In most cases, pharma works closely with drug distribution channels to ensure patient compliance as well.

AXTRIA
INGENIOUS INSIGHTS

By leveraging the wealth of patient-level data and advanced analytics techniques, pharma companies can carefully observe patient behavior to mitigate associated risks. This study illustrates Axtria's innovative AI/ML solution, designed for a global biopharmaceutical giant, to identify patients with a high-risk of dropout and improve drug adherence.

BUSINESS SCENARIO

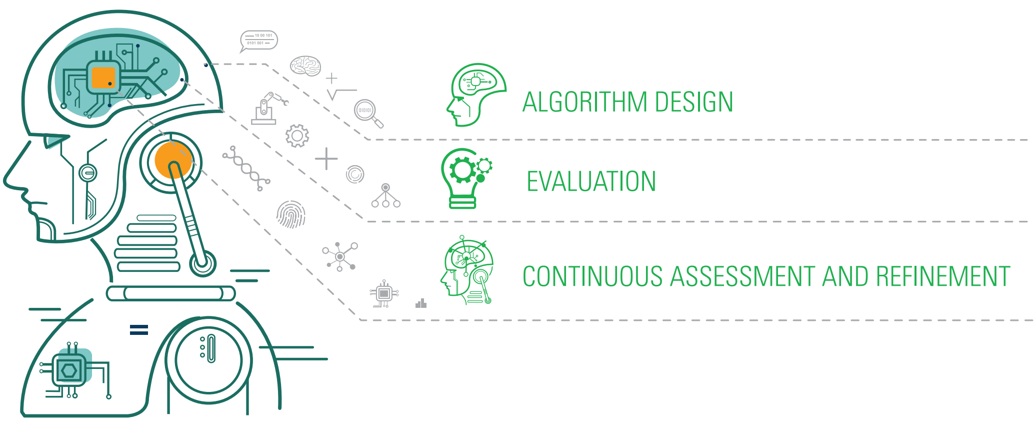
- Low adherence for a cardiovascular drug, indicated for a rare heart condition. The prescribed treatment would improve symptoms and significantly reduce healthcare costs and the risk of early death.
- About 45 percent of the patients discontinued using the drug within 90 days of prescription.
- The associated Specialty Pharmacies (SP) were trying to reduce non-adherence risks through patient support services and educational intervention programs. These programs intended to drive knowledge of drug usage, associated side-effects, and expected benefits.
- Designing and executing patient support services were accompanied by high costs, process fatigue, and the inefficiency in the process evaluation.

OBJECTIVE

- The company's SP team wanted to provide the SPs with non-adherence likelihood scores for each new patient. These scores would help to prioritize high-risk patients for enhanced and tailored intervention programs.
- There was a need to continuously score the patients with the non-adherence likelihood algorithm.
- The company's SP team wanted to assess the impact of the enhanced SP intervention programs on the drug's patient Days of Therapy (DoT).

APPROACH

As a solution, Axtria developed an AI/ML algorithm to monitor patient adherence. This process involved:

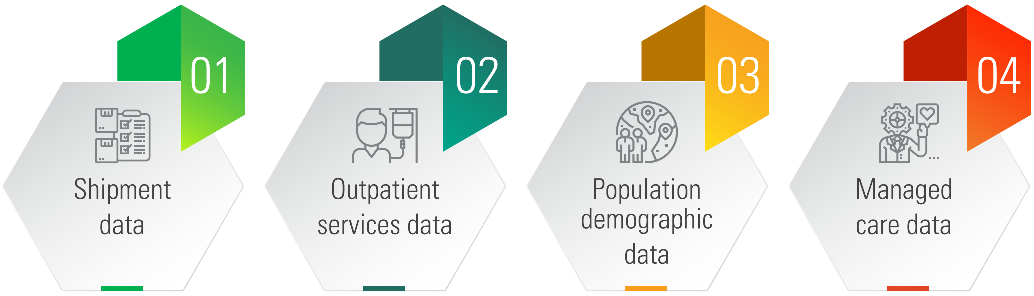


The solution approach consisted of the following steps:

DATA PREPARATION

1. Data collection and processing

A master dataset was created by integrating the available datasets, such as:

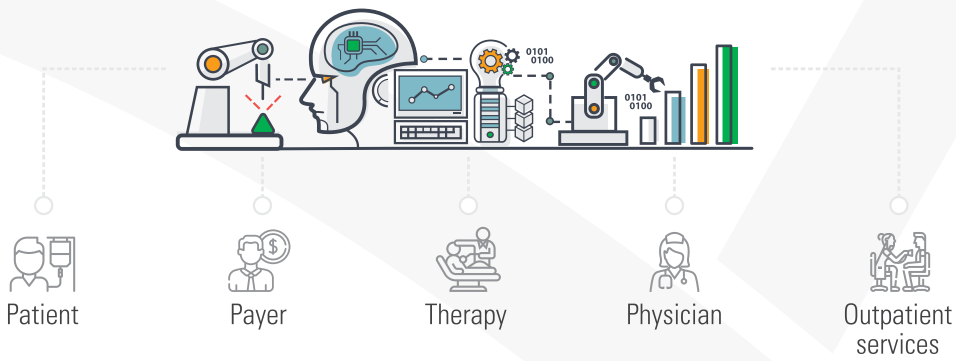


Each of these data sources was assigned the first-order feature regarding their primary effects on the algorithm.

2. Unsupervised ML for algorithm development

Advanced statistical techniques were used to identify the first-order features for unique patient non-adherence patterns.

The critical elements considered for the development of the algorithm were:



Out of the 160 patient features initially considered for the algorithm, 18 key parameters, which influenced patient behavior, were shortlisted.

ALGORITHM PRODUCTION AND EVALUATION

1. Supervised ML for algorithm development

- Numerous scoring and classification algorithms were executed using a variety of statistical techniques.
- An ML assembling method was used to combine patient-level predictions across all algorithms for creating patient tiers and classification. The technique helped obtain accurate predictions using multiple models on the same dataset.
- These probability-driven patient populations helped prioritize intervention programs.

HCP	Technique 1	Technique 2	Technique 3	ML Assembling	Topic
Patient A	0.6	0.65	0.55	0.6	✓ Target Intervention
Patient B	0.2	0.3	0.3	0.26	× No Target Intervention
Patient C	0.01	0.05	0.06	0.04	× No Target Intervention

2. **Development of the algorithm for production**
   - **Algorithm Design:** Business rules were used to define the patient personas with a high probability of non-adherence for the drug.
   - **Relay Mechanism:** Contact information of new patients with a high likelihood of non-adherence was shared periodically with the SPs.

3. **Continuous assessment to dynamically update and retrain the algorithm.**
   - **Assessment:** The impact of the targeted SP intervention programs was assessed on the incremental DoT.
   - **Update:** The algorithm was dynamically updated with non-adherence scores, every 2-to-4 weeks after the initial 6-week usage period and shared with SPs.
   - **Retrain:** The algorithm was continuously retrained to optimize performance against business rules thresholds.

KEY TAKEAWAYS

- Axtria identified more than 3,000 new patients, split into intervention classification tiers for the SPs.
- Over 400 new patients with high non-adherence risk were identified.
- Impact analysis showed increased adherence across test patients, with more than 50,000 incremental DoT estimated.
- The monetary value of the adherence algorithm exceeded $5M within the first six months, with a full roll-out projection value of $10M-$15M.
- By identifying high-risk patients, intervening appropriately, and increasing the corresponding DoT, the client would be able to benefit its patient population significantly and improve their health outcomes.

CONCLUSION

AI/ML-based solutions, powered by patient-level data, can precisely analyze, predict, and suggest next-best-actions to improve patient outcomes significantly. With appropriate actionable insights, pharma companies can partner with patient-facing stakeholders to enable targeted intervention programs and influence patient behavior, such as treatment adherence. Companies can also go the extra mile by integrating the point-of-sale (POS) data to create real-time alerts for patients, physicians, and retailers. These alerts can act as early warnings for drug refills, treatment dosage changes, and other non-adherence trends.

To learn more, read Axtria's blog on the *role of AI in healthcare patient adherence.*

REFERENCES

1. Viswanathan M, Golin CE, Jones CD, et al. Interventions to Improve Adherence to Self-administered Medications for Chronic Diseases in the United States: A Systematic Review. Ann Intern Med, December 2012. Available at https://annals.org/aim/fullarticle/1357338/interventions-improve-adherence-self-administered-medications-chronic-diseases-united-states