ProcDNA
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Predicting Near-Term Therapy Discontinuation

ProcDNA Case Study - Executive Readout

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Why early identification of discontinuation risk matters?

- Patients on specialty therapies often discontinue treatment not due to clinical reasons, but because of operational and access-related friction.
- Delays in shipments, refill rejections, payer changes, and prior authorization denials can silently disrupt therapy continuity before teams are able to intervene.
- This project was motivated by the need to identify at-risk patients early, using only the information available at a given point in time.

Project roadmap

Step 1

Capture longitudinal patient journey events

Step 2

Define a prediction anchor to freeze time

Step 3

Engineer pre-anchor behavioral and access features

Step 4

Score patients for near-term discontinuation risk

Goal

Enable targeted field intervention before therapy interruption

Modeling challenges encountered and how they were addressed

	Potential challenge	How I'd responded
1	The dataset contains future-looking fields (e.g., discontinuation flags, expected refill dates) that could unintentionally leak outcome information into features.	Introduced a prediction anchor per patient and enforced strict pre-anchor filtering, ensuring all features use only information available at the scoring moment.
2	Some provided fields (e.g., expected refill due date) were missing or non-populated for most patients, leading to non-informative features.	Validated feature distributions, confirmed lack of signal, and explicitly removed such features to avoid adding noise to the model.

Modeling challenges encountered and how they were addressed

	Potential challenge	How I'd responded
3	Highly discrete, low-cardinality behavioral features	Selected tree-based models that naturally handle non-linear thresholds and count-based features

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The solution

This is where the Solution comes in

I designed a point-in-time risk scoring framework that evaluates each patient's recent treatment and access experience at a specific moment in time.

The solution focuses on operational and access-related signals—such as shipment gaps, refill rejections, payer changes, and authorization denials—rather than static patient attributes.

Each patient is assigned a near-term discontinuation risk score, allowing field teams to proactively intervene before therapy interruption occurs.

A gradient-boosted model transforms these signals into a near-term risk score.

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Success Metrics

1

Problem relevance

23.4% of patients discontinued therapy within 60 days of the prediction anchor
This confirms that near-term discontinuation is common and operationally relevant
All 3,000 patients were label-eligible, enabling unbiased risk assessment

2

Signal strength & behavioral variability

Median time since last shipment was 44 days, with some patients exceeding 80 days
Shipment activity varied across patients (0–3 shipments in the last 90 days)
Refill rejections ranged up to 3 events in 60 days and 4 events in 90 days
Payer changes were frequent, with ~42% of patients experiencing at least one change in 90 days

3

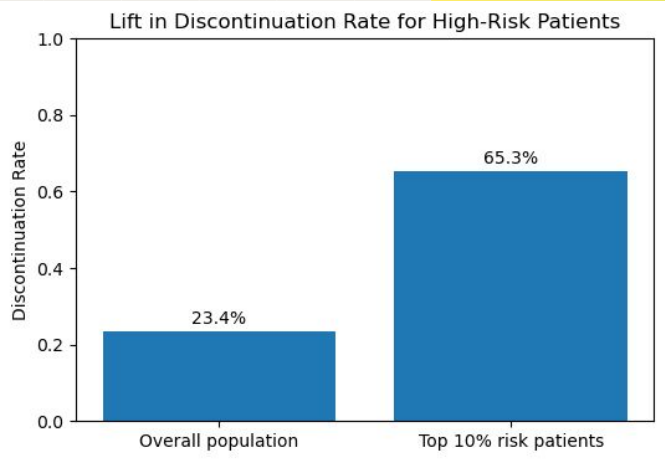
Model Driven Actionability & prioritization

Access friction events ranged from 0 to 5 per patient, enabling clear prioritization
Median patient experienced at least one access friction event
Higher friction levels indicate greater need for proactive intervention
Signals map cleanly to operational levers (refill support, payer escalation, benefits review)
Top-risk decile shows ~65% discontinuation rate
Risk score enables ranked outreach, not binary flags

Can we reliably identify near-term risk?

The model accurately separates high-risk from low-risk patients using only pre-anchor operational signals.

1. **Outcome prevalence:** 23.4% discontinued within 60 days
2. **Model type:** Gradient Boosting (tree-based, non-linear)
3. **AUC (ROC): 0.91**
4. **Precision in top risk decile: 65%**
   Meaning: *2 out of every 3 patients flagged as high risk actually discontinued*



1. Strong discrimination despite class imbalance
2. Model prioritizes *actionable operational risk*, not static demographics
3. Suitable for **capacity-constrained field teams**

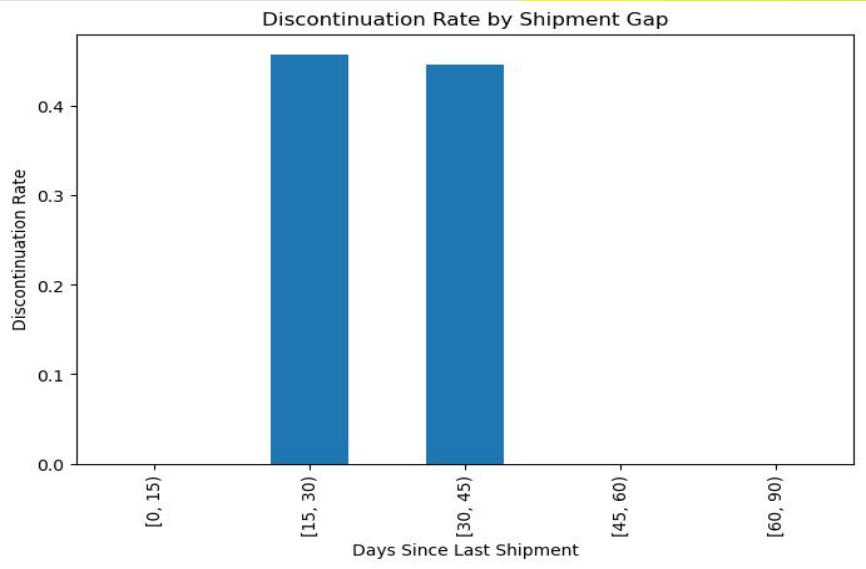
While only ~23% of patients discontinue overall, nearly 65% of patients in the top risk decile discontinue within 60 days. This lift enables field teams to focus limited capacity where it matters most.

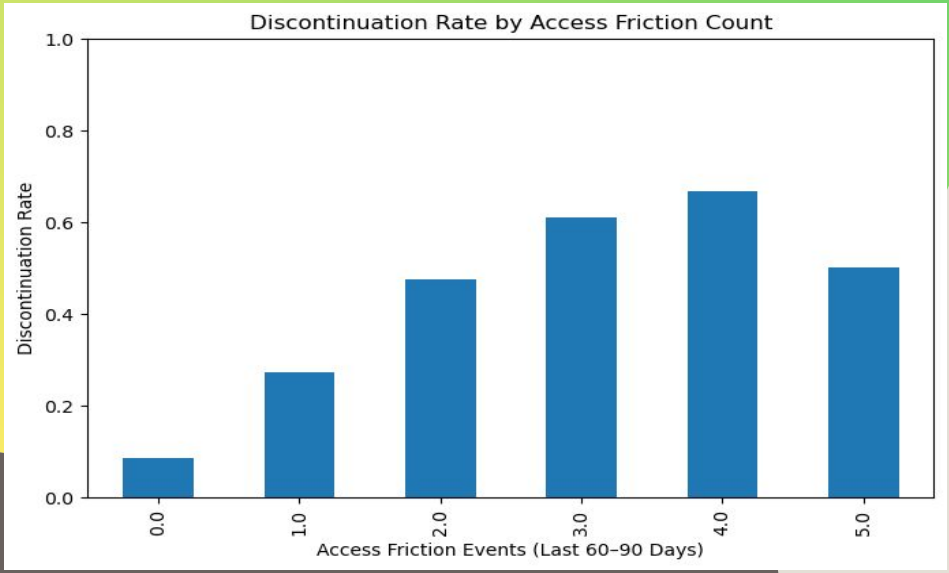
What drives near-term therapy discontinuation?

Ranked Drivers

1. **Days since last shipment** (dominant driver)
2. **Recent shipment cadence (90-day activity)**
3. **Recent access friction events**
   a. Refill rejections
   b. Payer changes
   c. Authorization denials

1. Patients who go longer without shipments are much more likely to discontinue
2. Repeated access friction compounds risk, even if each event seems minor
3. Risk accumulates before therapy stops creating an intervention window

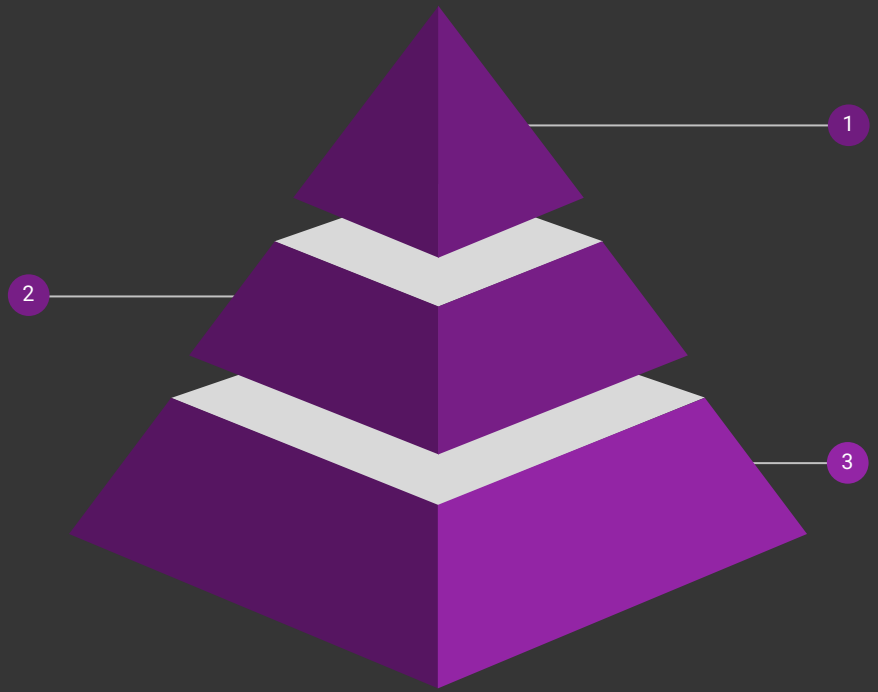




From risk scores to field action

High-risk signal -> Recommended action

1. >45 days since last shipment
    a. Immediate pharmacy coordination
    b. Confirm shipment status and patient reachability.
2. Multiple refill rejections
    a. Benefits investigation
    b. Payer escalation
3. Recent payer change
    a. Coverage re-verification
    b. Financial assistance review
4. Multiple friction events
    a. Assign case manager for proactive follow-up



Risk Stratification

1. Patients ranked by predicted risk score
2. Focus on top 10–20% highest risk
3. Enables prioritized outreach, not blanket intervention

Secondary Actions

1. Maximizes impact with limited field capacity
2. Maximizes impact with limited field capacity

Thank you