

Case Study



# Unleashing Machine Learning to Improve Patient Intervention Effectiveness



## Background

For more than seven years, IntegriChain has been working with a top-20 Life Sciences manufacturer whose vast portfolio spans oncology, respiratory, immunology, cardiovascular, and other therapeutic categories. Our partnership and collaboration was focused on helping Market Access, Trade and Channel, and Patient Services teams better leverage channel and patient data to derive deeper and faster insights about their business, brand performance, and the overall patient journey.

Recently, the Associate Director of Specialty Trade Operations approached IntegriChain seeking assistance with intervention reporting. Both teams collaborated on a proof-of-concept, but it was a manual, ad hoc process supported mostly by IntegriChain-built spreadsheets and a commercially-available business intelligence package. IntegriChain proposed additional collaboration to move this to a more automated, proactive, and repeatable solution..

“IntegriChain showed us how they could combine patient status, dispense, and other specialty pharmacy data together with machine learning to help us identify patients who were most likely to discontinue therapy. Wow!”

Associate Director,  
Specialty Trade  
Operations

## Employing Advanced Machine Learning for Predictive Analytics

IntegriChain applied advanced analytical and supervised machine learning techniques to analyze patient status, patient dispense and specialty pharmacy (SP) intervention data to create predictive models that will deliver insights for two business cases.

The first program was to predict when patients will opt-out of the interventions program. This was important to the manufacturer because patients who opt-out of patient intervention programs are more likely to experience a suboptimal patient journey and therefore, are more likely to discontinue therapy. The Market Access team felt it would be beneficial to understand the attributes and factors of the opt-out patient cases so the team could:





- Change overall tactics and messaging for patient intervention engagement
- Intervene on specific high risk opt-out patient cases prior to them opting out with specific messaging

The second program was to predict when patients will encounter gap days in therapy (patient case refills). Patients who experience even a short gap in refills have a higher chance of discontinuation or extended “drug holiday.” Understanding the factors driving this gap and potentially intervening prior to the gap occurrence would allow for different patient engagement strategies including:

- Changing overall tactics and messaging for all patient cases
- Intervening on specific high risk opt-out patient cases prior to them opting out with specific messaging
- Intervening on targeted key times of the patient journey when patients are more likely to miss refills

The IntegriChain business analysis and data science teams focused on assembling four primary data sets (shown below):

- Patient case attributes
- Patient engagement
- Key patient data
- Derived patient data

<b>Patient Case Attributes</b> 	<b>Patient Engagement</b> 	<b>Key Patient Data</b> 	<b>Derived Patient Data</b> 
<ul style="list-style-type: none"> <li>• Age</li> <li>• Gender</li> <li>• Geography</li> <li>• Payer</li> <li>• Channel</li> <li>• Healthcare provider (HCP)</li> </ul>	<ul style="list-style-type: none"> <li>• Length of patient journey</li> <li>• Interventions experienced</li> </ul>	<ul style="list-style-type: none"> <li>• ICD9/10</li> <li>• Referral date</li> <li>• Transferred</li> <li>• Opt in / Opt out</li> <li>• Specialty pharmacy</li> <li>• Bridge vs no bridge</li> <li>• Intervention event</li> <li>• Dispense</li> </ul>	<ul style="list-style-type: none"> <li>• Time to first fill (TTFF)</li> <li>• Fill / cancel</li> <li>• Time in sub-status</li> <li>• Time on therapy (ToT)</li> <li>• Missed intervention metric</li> <li>• Time from missed intervention</li> <li>• Accumulated gap days</li> </ul>

## Defining the Desired Insights

IntegriChain designed and led a series of insight workshops to identify specific questions, analytics, and insights the manufacturer was looking to better understand. These workshops revealed four categories of insights (summarized in the tables below) that were of primary importance:

- Intervention Data Quality – Are the SPs sending the correct intervention data?
- Intervention Engagement and Timing – How are the SPs engaging with interventions and are they doing in a timely manner?
- Intervention Cost Insights – Are the intervention costs within an acceptable range and insights into the total amount spent on costs?
- Intervention Effectiveness – How effective are the interventions?

Intervention Data Quality	
Issue/Concern	Required Insight
SP sending incorrect intervention codes	Analyze all intervention codes sent by each SP and evaluate these codes against an internal fact table. All codes that are incorrect or missing will be highlighted by the SP.
Duplicate interventions or interventions out of sequence	Review all interventions, identifying patients receiving duplicate interventions at or across SPs. Review all interventions at the patient level for correct intervention sequencing. This check will be performed upon each data feed.
Occurrences of interventions for patients who are not in the patient status data	Match all intervention patient IDs with the patient status information. Any occurrence of a patient ID that has an intervention but does not have an entry in the status data will be identified.

## Intervention Engagement and Timing

Issue/Concern	Required Insight
Are SPs executing the interventions at the right time in the patient journey?	Analyze all interventions that have timing requirements to ensure that they are executed within the acceptable intervention window.
Are SPs effectively engaging their patients?	Analyze how many patients are engaged for each intervention for each SP.

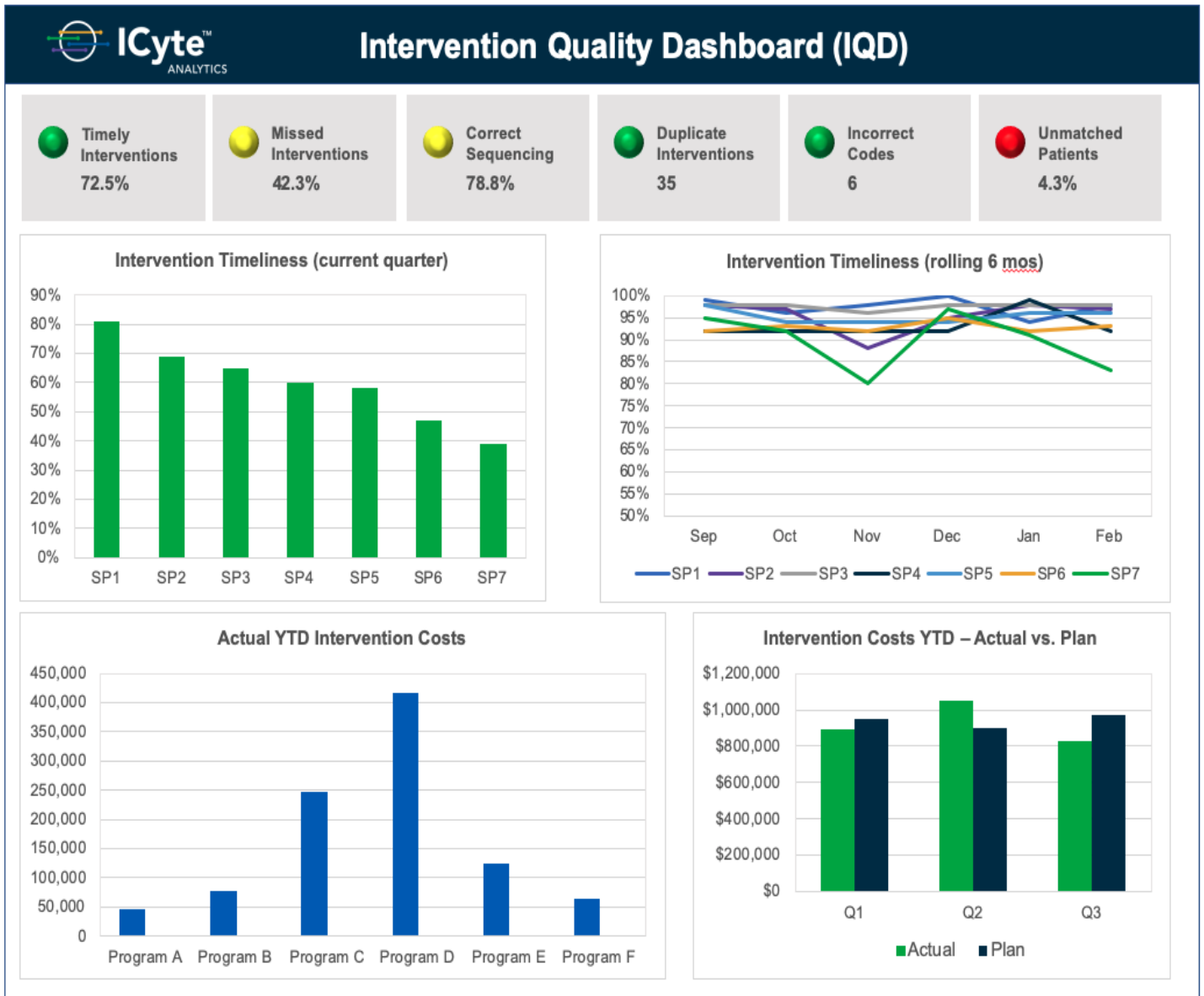
## Intervention Cost

Issue/Concern	Required Insight
Are SPs charging appropriate fees for each intervention?	Analyze all interventions by SP to ensure that each intervention cost is within an acceptable window of cost.
What is the total spend per intervention by SP?	Report on trends, and outliers for spend by intervention by SP.
Predict year-end cost for interventions	Utilize analog cost models to predict monthly and year end costs, per intervention at the SP level.

Intervention Effectiveness	
Issue/Concern	Required Insight
Who are the opt-out patient cases?	Analyze the key attributes of patients who opt out of the interventions program.
How are opt-out patients performing compared to engaged patients?	Analyze all interventions by opt out as compared with engaged for PDC, TOT, gap, and discontinuation.
How do missed or late interventions affect adherence performance?	Analyze missed or late intervention for gap days 30-days post intervention event.
What are the key drivers to predicting gap and discontinuation?	Create a comprehensive model that the machine learning language will analyze in an attempt to identify key attributes of patient data that will predict gap and discontinuation.

## Revealing Results on the Power of Patient Intervention

Utilizing the models and underlying data, IntegriChain developed a set of reports and dashboards similar to the ones shown below. This enabled the manufacturer’s Market Access, Patient Services, and Commercial Analytics teams to be able to visualize the impact of their programs on patient adherence by patient cohort and quantify the benefits of intervention. Additionally, the machine learning algorithms became an accurate predictor of gap days and lastly, the models revealed the previously hidden costs associated with duplicate interventions.





### PDC

92.8% Engaged  
77.2% Disengaged

### ToT

471.6 Engaged  
237.1 Disengaged

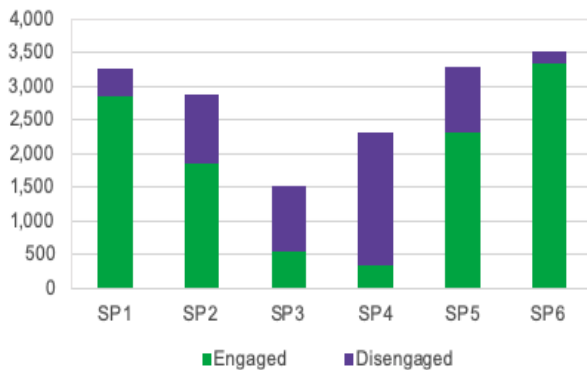
### Gap Days

13.2 Engaged  
26.4 Disengaged

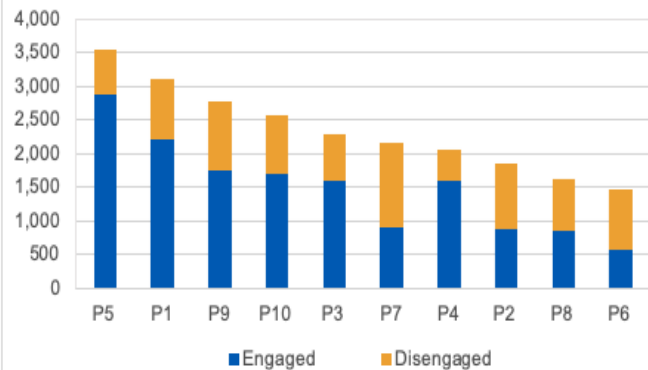
### Discontinuations

29.4 Engaged  
53.7 Disengaged

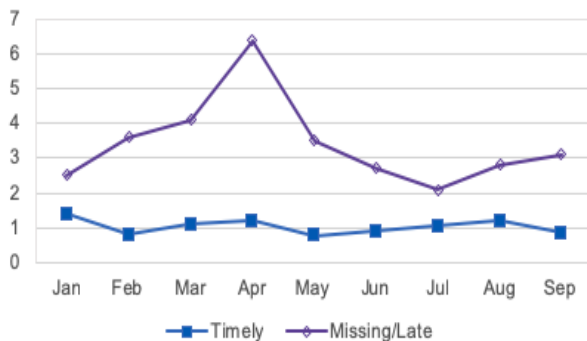
Engaged vs. Disengaged by Specialty Pharmacy



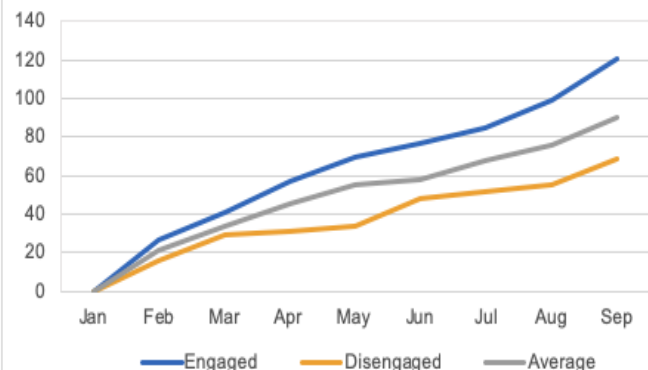
Engaged vs. Disengaged by Top 10 Payers



Average Gap Days for Interventions (engaged patients)



ToT Comparison





## Next Steps

The manufacturer was delighted with this newfound insight and ability to access this information in an automated, on-demand manner. The next step is to be able to examine this data at the patient level, taking age, prescriber, and gender attributes into account. Furthermore, the manufacturer wants IntegriChain to help them better align patient services data with dis-pense data, all with the goal of improving their understanding of the patient journey.

## About IntegriChain

IntegriChain is Life Sciences' data and application backbone for patient access and therapy commercialization. More than 250 manufacturers rely on IntegriChain's ICyte Platform to orchestrate commercial and government payer contracting, patient services, and distribution channels. ICyte is the first and only platform that unites the financial, operational, and commercial data sets required to support therapy access in the era of specialty and precision medicine. With ICyte, Life Sciences innovators are digitalizing labor-intensive processes – freeing up their best talent to identify and resolve coverage and availability hurdles and to manage pricing and forecasting complexity. IntegriChain is backed by Accel-KKR, a leading Silicon Valley technology private equity firm. The company is headquartered in Philadelphia, PA, with offices in Ambler, PA; Somerset, NJ, Raleigh, NC, and Pune, India.



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