INTEGRATED ROOT CAUSE ANALYSIS

Connecting Revenue Leakage Patterns to Underlying Drivers

Medicare Part B Carrier Claims | Operational Intelligence Report

1. EXECUTIVE SYNTHESIS: FROM WHAT TO WHY

This integrated analysis bridges the gap between descriptive metrics (WHAT is happening) and diagnostic insights (WHY it is happening). By connecting the basic Revenue Cycle Operations (ROS) analysis with root cause investigation, we transform operational data into actionable intelligence.

1.1 The Analysis Journey

Phase	Question Answered	Key Finding
Basic ROS Analysis	WHAT is the magnitude of leakage?	$5.48M underpayment (22.2%)
Root Cause Analysis	WHY is leakage occurring?	8 distinct causal dimensions identified

1.2 Critical Connection Points

The root cause analysis reveals that the $5.48M revenue leakage identified in the basic analysis is NOT random but driven by systematic, identifiable patterns across 8 dimensions:

1. Diagnosis Patterns (Clinical Driver)
2. Place of Service (Location Driver)
3. Provider Characteristics (Geographic Driver)
4. Service Complexity (Coding Driver)
5. Temporal Patterns (Timing Driver)
6. Carrier Patterns (Payer Driver)
7. Procedure Modifiers (Procedural Driver)
8. Assignment Status (Reimbursement Driver)

2. ROOT CAUSE DIMENSION 1: DIAGNOSIS-DRIVEN LEAKAGE

2.1 The Clinical Connection

BASIC FINDING: The top 2 HCPCS codes (96156 - Health Behavior Assessment, 94010 - Spirometry) account for 42% of total underpayment.

ROOT CAUSE DISCOVERY: These procedures are overwhelmingly associated with specific diagnosis codes that have inherently high denial rates.

2.2 High-Risk Diagnosis Codes

Diagnosis	Description	Claims	Total Underpayment	Denial Rate
Z733	Stress, not elsewhere classified	52,509	$1.66M	62%
Z608	Other counseling	29,466	$840K	61%
I259	Chronic ischemic heart disease	9,795	$461K	60%
T7432X	Nicotine dependence	12,109	$312K	62%
Z604	Substance abuse counseling	10,755	$293K	63%
R931	Abnormal findings on imaging	4,695	$228K	60%
M5450	Low back pain	3,587	$92K	61%
M7918	Myalgia	2,700	$87K	60%
N184	Chronic kidney disease	3,098	$82K	66%
J449	COPD, unspecified	371	$57K	56%

2.3 Pattern Recognition

CRITICAL INSIGHT: The top 10 diagnoses reveal a strong concentration in behavioural health, counselling, and preventive services. These diagnostic categories show systematic underreimbursement patterns.

Behavioural Health Cluster:

- Z733 (Stress): 52,509 claims, $1.66M leakage
- Z608 (Counselling): 29,466 claims, $840K leakage
- Z604 (Substance abuse counselling): 10,755 claims, $293K leakage
- T7432X (Nicotine dependence): 12,109 claims, $312K leakage

Combined Impact: 104,839 claims (60% of dataset) with $3.10M in leakage (57% of total)

2.4 Connection to HCPCS Analysis

From Basic Analysis → Root Cause:

HCPCS Code	Service Type	Primary Diagnosis	Root Cause
96156	Health Behavior Assessment	Z733 (Stress)	Behavioral health coverage limits
94010	Spirometry	J449 (COPD)	Chronic disease management restrictions

2.5 High-Risk Diagnoses: 35 Identified

Root cause analysis flagged 35 diagnoses with >70% denial rates OR top 10% average underpayment:

Diagnosis	Denial Rate	Avg Underpayment
I214 (ST elevation MI)	80%	$131.01
Z7682 (BMI 40.0-44.9)	77%	$39.77
Z951 (Presence of pacemaker)	71%	$44.40
P2830 (Primary apnea of newborn)	71%	$41.25
J449 (COPD unspecified)	56%	$153.19

3. ROOT CAUSE DIMENSION 2: PLACE OF SERVICE IMPACT

3.1 Location-Based Performance Variance

BASIC FINDING: Revenue realisation varies by service setting, but the basic analysis did not quantify this variation.

ROOT CAUSE DISCOVERY: Denial rates vary significantly by place of service, with office settings showing dramatically different patterns than hospital settings.

3.2 Place of Service Performance Matrix

POS Code	Setting	Claims	Denial Rate	Avg Allowed	Avg Processing
34	Hospice	268	63%	$178.62	4.03 days
11	Office	142,899	62%	$131.83	4.01 days
12	Home	590	60%	$82.49	3.88 days
20	Urgent Care	28,611	59%	$127.65	3.95 days
31	Skilled Nursing	649	57%	$165.31	4.35 days
22	Outpatient Hospital	1,601	11%	$1,261.44	4.21 days

3.3 Critical Discoveries

MAJOR ANOMALY DETECTED: Outpatient Hospital (POS 22) shows:

- 11% denial rate (vs. 60-63% for other settings)
- $1,261 average allowed amount (9.6x higher than office)
- Only 1,601 claims (0.9% of total volume)

INTERPRETATION: Outpatient hospital services represent a completely different reimbursement model with facility fees, resulting in higher allowed amounts and lower denial rates. The 89% of claims in office settings (POS 11) drive the majority of the 61% overall denial rate.

3.4 Strategic Implication

The concentration of 81.8% of claims in office settings (POS 11) with a 62% denial rate directly explains why the overall portfolio shows 61% zero-payment. This is NOT a quality issue but a setting-specific reimbursement pattern.

4. ROOT CAUSE DIMENSION 3: GEOGRAPHIC PATTERNS

4.1 State-Level Performance Variance

BASIC FINDING: The specialty-level analysis showed minimal variation (only 2 specialties), limiting geographic insights.

ROOT CAUSE DISCOVERY: Significant state-level variation exists in denial rates, suggesting regional payer policies or provider practice patterns.

4.2 Top 10 States by Denial Rate

State	Claims	Denial Rate	Total Underpayment	Avg Processing
CT	1,718	67%	$58,843	4.33 days
DE	489	65%	$14,204	3.47 days
AK	232	65%	$4,498	5.22 days
TN	3,941	65%	$118,323	4.26 days
MS	1,828	65%	$79,160	4.12 days
IA	1,628	64%	$45,569	4.30 days
NM	1,049	64%	$37,590	3.59 days
NV	1,593	64%	$55,800	4.35 days
OR	1,882	64%	$62,003	3.97 days
VT	466	64%	$5,896	4.08 days

4.3 Geographic Variation Analysis

PATTERN IDENTIFIED: Denial rates range from 56% to 67% across states, a 11-percentage-point spread.

Key Observations:

- Connecticut (CT) shows highest denial rate (67%) despite average processing time
- Alaska (AK) has the longest processing time (5.22 days) with 65% denial rate
- Delaware (DE) shows the fastest processing (3.47 days) but 65% denial rate
- Processing speed does NOT correlate with denial rates

4.4 Carrier Number Correlation

Root cause analysis reveals carrier numbers map to states, explaining geographic variation:

Carrier	Claims	Denial Rate	Avg Processing
591 (CT)	1,718	67%	4.33 days
512 (MS)	1,828	65%	4.12 days
831 (AK)	232	65%	5.22 days
902 (DE)	489	65%	3.47 days
5440 (TN)	3,941	65%	4.26 days

CONCLUSION: Geographic variation is real and stems from carrier-specific (regional Medicare Administrative Contractor) policies and practices, not provider performance differences.

5. ROOT CAUSE DIMENSION 4: SERVICE COMPLEXITY

5.1 The Complexity Paradox

BASIC FINDING: Variation analysis identified services with high coefficient of variation, but did not explain the underlying driver.

ROOT CAUSE DISCOVERY: Claims with multiple diagnoses (complexity) show HIGHER denial rates, contradicting expectations that more documentation would improve approval rates.

5.2 Number of Diagnoses vs. Denial Rate

Diagnoses	Claims	Denial Rate	Avg Underpayment	Avg Claim Size
1	474	18%	$42.92	$182.33
2	686	37%	$37.63	$151.20
3	1,176	42%	$34.87	$185.56
4	1,278	60%	$34.80	$152.28
5	1,670	63%	$32.37	$176.52
6	3,828	65%	$36.89	$176.91
7	4,899	64%	$36.87	$176.05
8	6,266	64%	$38.81	$182.06
9	7,095	65%	$36.66	$181.75
10	8,419	65%	$33.68	$156.16
11	8,111	64%	$42.07	$199.77
12	130,743	60%	$29.46	$129.38

5.3 Complexity Analysis Findings

STRIKING PATTERN: Denial rates jump from 18% (1 diagnosis) to 65% (6+ diagnoses)

Critical Thresholds:

- 1-3 diagnoses: 18-42% denial rate (acceptable)
- 4 diagnoses: INFLECTION POINT → 60% denial rate
- 5+ diagnoses: Consistently 63-65% denial rate
- 12 diagnoses: 130,743 claims (75% of dataset) at 60% denial

PARADOXICAL INSIGHT: More diagnoses = MORE denials, not fewer. This suggests that maximum diagnosis coding (12 codes) may trigger automated review or denial algorithms, or these represent bundled behavioral health services with systematic coverage limitations.

5.4 Service Count Analysis

Additional complexity metric: Number of service units per line

Service Units	Claims	Denial Rate
0	302	5%
1	826	10%
2-3	6,802	7%
4-6	3,106	27%
7-9	11,726	54%

Pattern: Higher service counts correlate with higher denial rates, reinforcing the complexity-denial relationship.

6. ROOT CAUSE DIMENSION 5: TEMPORAL PATTERNS

6.1 Time-Based Analysis

BASIC FINDING: Average processing time is 4 days (excellent), with 100% of claims in the 0-30 day bucket.

ROOT CAUSE DISCOVERY: While processing speed is consistent, denial rates and processing delays vary by day of the week, suggesting batch processing or timing effects.

6.2 Day of Week Performance

Day	Claims	Denial Rate	Avg Delay (days)
Monday	23,401	62%	4.0
Tuesday	25,105	61%	3.0
Wednesday	26,475	61%	2.0
Thursday	25,108	61%	1.17
Friday	24,205	61%	7.0
Saturday	26,219	60%	6.0
Sunday	24,132	60%	5.0

6.3 Temporal Pattern Insights

PROCESSING DELAY PATTERN: Services on Thursday have fastest processing (1.17 days), while Friday services take 7 days

Possible Explanations:

- End-of-week submissions may be processed the following week
- Weekend services (Sat/Sun) show slightly lower denial rates (60%)
- Weekday volume distribution is relatively even (23K-26K claims per day)

6.4 Monthly Patterns

Month	Claims	Denial Rate
Q1 (Jan-Mar)	41,369	61%
Q2 (Apr-Jun)	46,086	61%
Q3 (Jul-Sep)	44,329	61%
Q4 (Oct-Dec)	42,861	61%

Finding: Remarkably consistent denial rates across months and quarters (61%), suggesting no seasonal effects.

7. INTEGRATED ROOT CAUSE SYNTHESIS

7.1 High-Underpayment Claim Profile

Root cause analysis examined the top 10% of underpayment claims (17,280 claims) to identify common characteristics:

7.2 Profile of High-Risk Claims

Dimension	Top Characteristic	Frequency
Diagnosis	Z733 (Stress)	5,207 claims (30%)
HCPCS Code	96156 (Health Behavior)	5,804 claims (34%)
Place of Service	11 (Office)	13,375 claims (77%)
Combined	Z733 + 96156 + POS 11	Highly overlapping

CRITICAL INTEGRATION: The same services (96156), diagnoses (Z733), and settings (Office POS 11) appear consistently in high-underpayment claims. This represents a CONCENTRATED risk profile, not random variation.

7.3 The Behavioural Health Hypothesis

Connecting all root cause dimensions:

Evidence Chain:

1. Top HCPCS: 96156 (Health Behaviour Assessment) → 34% of high-underpayment claims
2. Top Diagnosis: Z733 (Stress) → 30% of high-underpayment claims
3. Behavioural Health Cluster:
   Z-codes (counselling/stress/substance abuse) → 57% of total leakage
4. Place of Service: Office (POS 11) → 82% of claims, 62% denial rate
5. Complexity: 12 diagnoses → 75% of dataset, 60% denial rate

UNIFIED CONCLUSION: The $5.48M revenue leakage is primarily driven by office-based behavioural health and counselling services that are systematically underpaid or denied, likely due to Medicare coverage policies limiting reimbursement for these service types.

8. FROM INSIGHTS TO ACTION: STRATEGIC RECOMMENDATIONS

8.1 Root Cause → Action Mapping

Each identified root cause has specific, actionable interventions:

Root Cause	Impact	Action	Expected Result
Behavioural Health Diagnoses	$3.1M leakage	Review coverage policies, alternative billing codes	15-20% recovery ($465K-$620K)
Office Setting (POS 11)	82% of volume	Develop setting-specific coding protocols	5% denial reduction
Geographic Variation	11-point spread	State/carrier-specific training	Standardise to the best performers
Service Complexity	75% at 12 diagnoses	Optimise diagnosis coding (reduce to 6-8)	5% improvement
HCPCS 96156	$1.17M leakage	Alternative procedure codes, pre-authorisation	$200K-$300K recovery
HCPCS 94010	$1.12M leakage	Bundling strategy, medical necessity documentation	$150K-$250K recovery
High-Risk Dx (35 codes)	70%+ denial	Create a denial prevention checklist	Reduce submissions by 10%
Connecticut Carrier	67% denial	Escalate to MAC, review contracts	Align to 61% benchmark

8.2 Prioritised Action Plan

PHASE 1: Quick Wins (0-30 Days)

1. Implement pre-submission review for Z-code diagnoses (stress, counselling, substance abuse)
2. Create provider education on 96156 coverage limitations and alternative codes
3. Flag claims with 12 diagnoses for coding optimisation
4. Develop Connecticut/high-denial state-specific protocols

Expected Impact: $150K-$200K monthly savings

PHASE 2: Process Improvements (30-90 Days)

1. Build an automated denial prediction model using root cause factors
2. Establish carrier-specific submission guidelines
3. Implement place-of-service optimisation (shift viable services to POS 22)
4. Create diagnosis + HCPCS combination alerts

Expected Impact: Additional $200K-$300K savings

PHASE 3: Strategic Initiatives (90-180 Days)

1. Negotiate with Medicare MACs on behavioural health coverage
2. Develop alternative service delivery models (telehealth, group sessions)
3. Implement a continuous monitoring dashboard with root cause alerts
4. Expand analysis to include provider-specific patterns

Expected Impact: Sustained $400K-$600K annual savings

9. MEASUREMENT & MONITORING FRAMEWORK

9.1 Key Performance Indicators by Root Cause

Root Cause Area	KPI Metric	Current	Target
Diagnosis	Behavioral health denial rate	61%	<50%
Diagnosis	High-risk Dx (35 codes) submission rate	100%	<70%
Place of Service	Office (POS 11) denial rate	62%	<55%
Geographic	Denial rate variance across states	11 pts	<5 pts
Complexity	% claims with 12 diagnoses	75%	<60%
HCPCS	96156 realization rate	79.2%	>85%
HCPCS	94010 realization rate	79.1%	>85%
Overall	Portfolio denial rate	61%	<50%

9.2 Monthly Dashboard Components

Recommended monitoring frequency:

Weekly Monitoring:

- Denial rate by HCPCS (top 10)
- Behavioural health diagnosis submission volume
- Claims with 12 diagnoses flagged

Monthly Reporting:

- State-level denial rates
- Place of service performance matrix
- Root cause contribution to variance
- Recovery progress vs. targets

Quarterly Review:

- Comprehensive root cause re-analysis
- Emerging pattern detection
- Carrier relationship assessment
- Strategic plan adjustment

10. ANALYTICAL LIMITATIONS & CAVEATS

10.1 Data Limitations

Single Year Scope:
- Analysis limited to 2022 calendar year
- Cannot assess trend changes or policy shifts
- Seasonal patterns within a single year may not be representative

Denial Code Ambiguity:
- All claims show denial code "1" - meaning unclear from data dictionary
- Cannot distinguish different denial reasons
- May represent a data artefact rather than an actual denial taxonomy

Missing HCPCS Codes:
- 62.2% of lines lack HCPCS codes
- Service-level analysis limited to 37.8% of claims
- May underrepresent certain service types

10.2 Analytical Caveats

Correlation vs. Causation:
- Root causes identified through correlation analysis
- True causal mechanisms require policy-level investigation
- Multiple factors may interact in complex ways

Coverage Policy Assumptions:
- Behavioural health coverage limitations inferred, not confirmed
- Actual Medicare policy requires verification with CMS guidance
- Local Coverage Determinations (LCDs) may vary by MAC

11. INTEGRATED CONCLUSION

11.1 The Complete Picture

By integrating basic Revenue Cycle Operations analysis with comprehensive root cause investigation, we have transformed a $5.48M revenue leakage number into an actionable operational intelligence framework.

11.2 Key Discoveries Summary

Discovery	Implication
Behavioral health services drive 57% of leakage	Concentrated risk, targeted intervention possible
Office setting (POS 11) accounts for 82% of volume	Setting-specific protocols needed
12 diagnosis coding pattern covers 75% of claims	Coding optimization opportunity

11.3 Strategic Path Forward

From What to Why to How:

WHAT: $5.48M revenue leakage (Basic Analysis)

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WHY: Behavioral health coverage limits + Office setting + Coding complexity (Root Cause)

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HOW: Targeted interventions with $575K-$625K recovery potential (Action Plan)

11.4 Expected Outcomes

Metric	Current State	Target State (12 months)
Revenue Realization Rate	77.8%	83-85%
Behavioral Health Denial Rate	61%	48-50%
Annual Leakage	$5.48M	$4.0-$4.2M
Recovery vs. Baseline	$0	$1.3-$1.5M

11.5 Final Recommendation

PROCEED WITH PHASED IMPLEMENTATION. The root cause analysis has validated that revenue leakage is systematic and addressable through specific interventions. The concentration of leakage in identifiable service types, diagnoses, and settings creates focused opportunities for improvement with measurable ROI.

Begin with Phase 1 quick wins targeting behavioural health services (Z-codes) and HCPCS 96156/94010, which together represent $3.1M+ in addressable leakage. Success in these areas will build momentum for broader process improvements and strategic initiatives.

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