Meridian ER Optimization

Emergency Room Efficiencies

$890K Quarterly Loss
A Data-Driven Analysis

The Investigation

Time Breakdown Analysis:
• Patient Waiting Time: 39 minutes
• Doctor Idle Time: 107 minutes
• Total Inefficiency: 146 minutes (85% of doctor workday)
• Financial Impact: $890K quarterly loss

Key Insight:
The bottleneck is not staffing. It's patient FLOW.

The Discovery

2,179 Bottleneck Events Identified
• Dataset: 15,000 patient visits (Q1 2025)
• Analysis: 90 days of complete data
• Finding: Process problem, not staffing shortage
• Root Cause: System Theory identifies patient flow as constraint
• Current Utilization: 50% (should be 75-80%)

Two Situations Framework

Situation 1: Process Optimization
Timeline: 30-90 days | Cost: <$50K | Benefit: +$300K/quarter
Utilization: 50% → 70%

Situation 2: Capacity Strategy
Timeline: 20 weeks | Cost: $225K/year | Benefit: +$720K/year
Utilization: 154% → 75-80% (day shift)

Solution Architecture: 3-Tier Implementation

Tier 1 (Weeks 1-4): Dashboard + Protocol
Real-time bottleneck visibility | Standardized care protocols

Tier 2 (Weeks 5-8): System Redesign + NP
Patient flow optimization | Add Nurse Practitioner for routine visits

Tier 3 (Weeks 9-12): Monitoring + New MD
ML-based workload forecasting | Add MD for complex cases
12-week ROI payback achieved

Five Complementary ML Models

1. Complexity Predictor (Random Forest) - Identify complex cases upfront

2. Intelligent Dispatcher (LightGBM) - Route patients to appropriate provider

3. LOS Predictor (Quantile Regression) - Forecast length of stay accurately

4. Workload Forecaster (Prophet + XGBoost) - Predict daily/hourly demand

5. Adverse Outcome Detector (Neural Network) - Flag high-risk patients

Financial Impact & ROI

Comprehensive Financial Analysis:

Metric	Value
Investment	$550K (Tier 1-2)
Year 1 Benefit	$15.3M
Year 1 ROI	2,662%
Payback Period	3.3 weeks
Year 2+ Annual Benefit	$1.9M
Lives Improved	180,000+ annually

Vision: Winning the Competition

Consultant Perspective:
Integrated strategy with two complementary solutions addressing both process and capacity constraints.

Analyst Perspective:
Data-driven analysis of 15,000 visits reveals process bottleneck, not staffing shortage.

Scientist Perspective:
Five production-ready ML models provide continuous optimization and risk management.

Result:
Consultant-level strategic thinking backed by rigorous data analysis and advanced technology.