

A Data-Driven Approach to Increasing Margin and Improving Care

Dr. Jamie McGlothlin

Introduction

RSM Introductions



Jamie McGlothlin

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Health Care Analytics National Lead

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Jamie provides health care analytics for health systems to drive performance improvement in clinical quality, patient safety, operational efficiency and cost reduction.

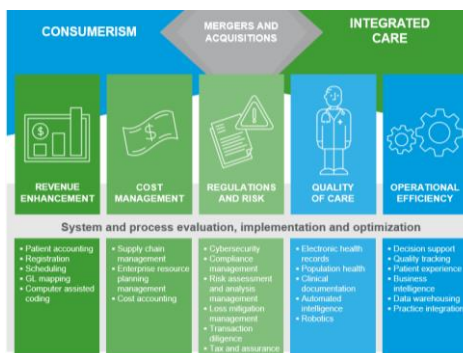
- PhD in computer science
- 30 years experience, 11 years in health care analytics consulting
- 13 peer-reviewed research publications in leading health care conferences
- Millions of \$ in ROI generated for health care clients



About RSM and our Healthcare Practice

HEALTH CARE SERVICES OVERVIEW

An integrated approach enables us to bring a diverse range of experience to the table



RSM HEALTH CARE
MEMBERSHIP HIGHLIGHTS



13

Modern Healthcare ranks RSM among the nation's top largest health care management consulting firms

400

RSM health care professionals

150

RSM health care consulting professionals

~3,000

Health care clients

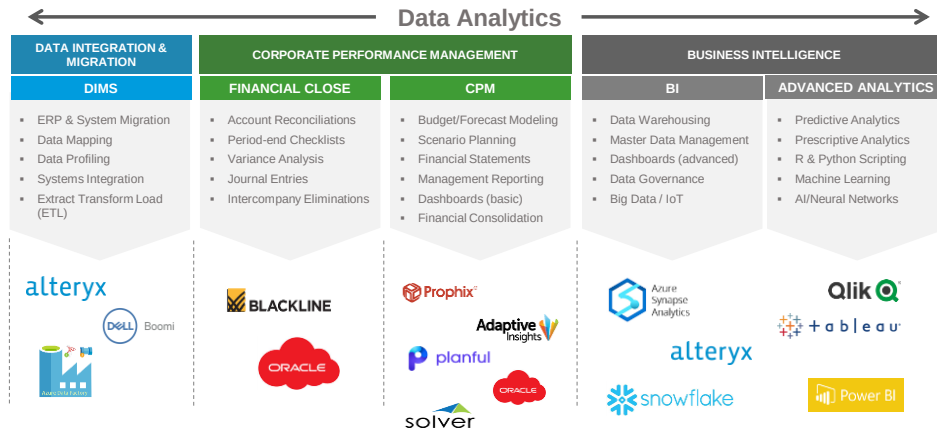
1,440

Physician clients

\$100M

RSM U.S. health care industry revenues

RSM Background: Data Analytics and Example Solutions



RSM Health Care Data Analytics: Approach

- **Data-driven**
- Use data to choose opportunities
- **Augment not replace**
- Leverage EMR and existing data warehouses and solutions
- **Use the client's tools**
- Tool agnostic
- **No new silos**
- Clients have too many tools and too much data already
- **Time to Value**
- Short term ROI, Long term sustainability
- Solutions build on each other



MULTI-PHASED AGILE APPROACH

- ✓ Deliver short term return on investment
- ✓ Design data solutions which build a long-term foundation reusable for many analytics

LEVERAGE & AUGMENT EXISTING SOLUTIONS

- ✓ Utilize your data warehouse and business intelligence tools
- ✓ Leverage your EMR (Epic, Cerner, Meditech)

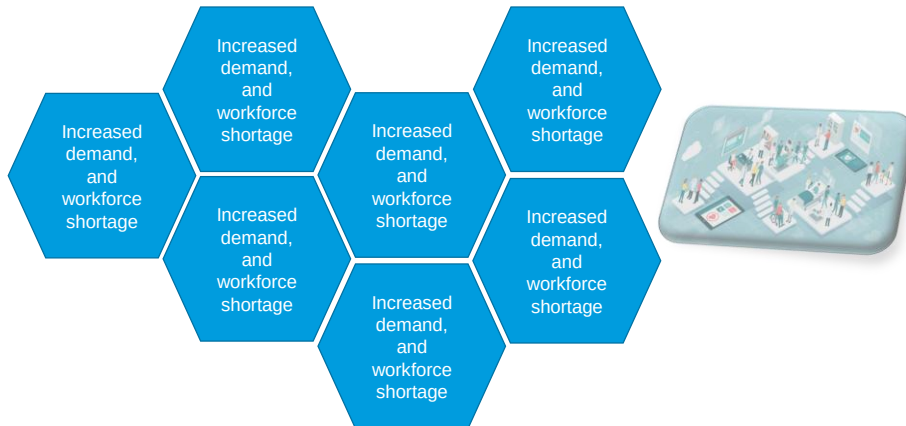
INTEGRATE SOURCES & ELIMINATE SILOS

- ✓ Join EMR data with other sources such as patient experience, cost, registries
- ✓ Create a single version of the truth, an enterprise analytics data source

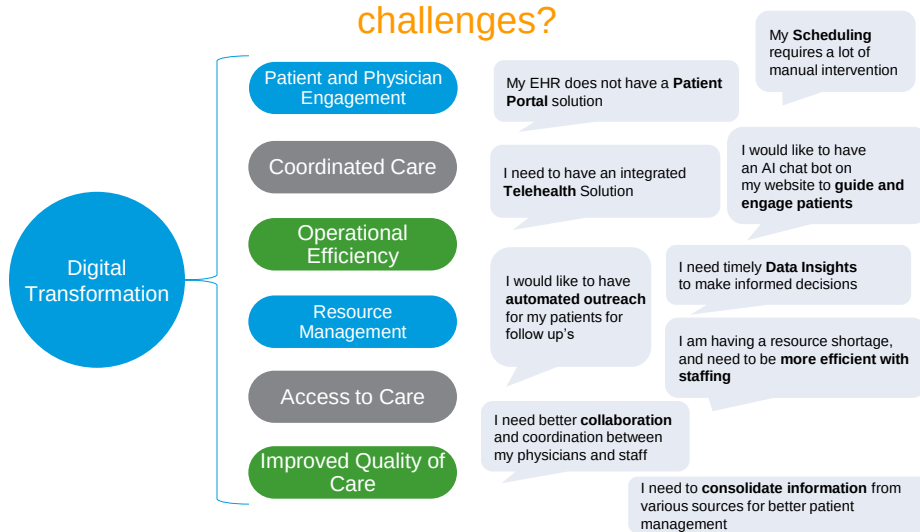
PROVIDE INTUITIVE & INTERACTIVE VISUALIZATIONS

- ✓ Consistent look and feel
- ✓ Reduce learning curve
- ✓ Tool agnostic but we have deep experience with Tableau, PowerBI and Qlik

Key Challenges in the Healthcare Industry



What are organizations doing to address these challenges?



Increasing Margin

- Increase Revenue
 - Do More
 - Marketing Analytics • Care Gaps • Referrals Management
 - Capture More Revenue
 - Registration/Verification • Clinical Documentation • Denials • Accounts Receivable
- Reduce Cost
 - Reduce LOS • Optimize Staffing • Manage Utilization • Supply Chain • Automation
- Be More Efficient
 - Patient Movement • Scheduling • Productivity • Surgical Efficiency • Automation
- Do Better
 - Reduce Complications • Readmissions • Mortality • Patient Experience

Agenda

Increase Revenue

- Marketing Analytics
- Care Gaps
- Denials

Reducing Cost

- Length of Stay
- Efficiency
- Care Paths
- Process Intelligence
- Staffing Optimization
- Utilization

Doing Better

- Quality
- Patient Experience

Getting Started

- Assessments
- Contact Info

Marketing Analytics

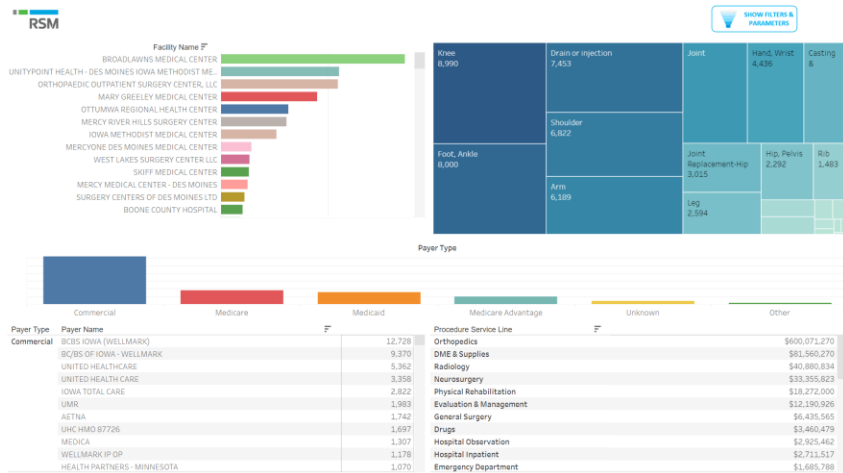
Marketing Analytics

- What providers should I hire? Or collaborate with?
- Should I build an ambulatory surgical center?
- Where should I invest?
- Should I buy an orthopedic surgery group?

To answer these types of questions, we leverage claims data

- For patients in my geography who go to other health systems, what specialists are they seeing? What procedures?
- When my doctors refer to other providers, what specialists do they refer to?
- How many orthopedic surgeries are performed in my area? What ancillary services are received?

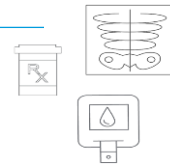
Demo



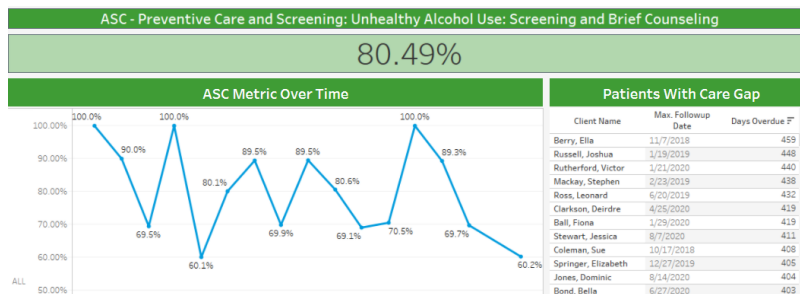
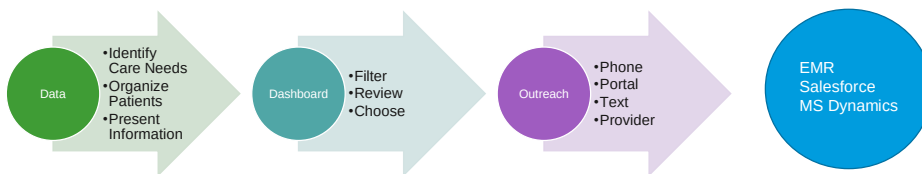
Care Gaps

Care Gaps: How Do We Identify Patients' Needs?

Scheduling	Cancelled appointments
Orders	Labs, images, treatment which was ordered but not performed
Wellness	Best practice preventive care which is overdue
Chronic disease	Best practice preventive care/evaluation/treatment which is overdue
Care path	Care path recommended treatment is not performed
Risk analysis	Patient is in danger of negative event



How Do We Engage the Patient?



CASE STUDY: COPD population health

PROBLEM	GOAL	APPROACH	RESULTS
Pediatric COPD patients frequent emergency room for asthma attacks or other flare ups	Improve chronic disease management for COPD population to reduce acute events	1. Combine EMR data with claims data from payors 2. Identify care gaps • Medication adherence (inhalers) • Regular wellness visits • Diagnostic tests (spirometry) 3. Patient outreach	Reduced avoidable ER visits by 27%

Can also be applied to any chronic disease with preventive care recommendations, including:

- ✓ Diabetes
- ✓ Coronary Artery Disease
- ✓ Depression

CASE STUDY: Congenital Heart Defects (CHD)

PROBLEM	GOAL	APPROACH	RESULTS
Patients born with heart defects often do not follow-up after diagnosis or surgical repair	Improve care and increase revenue by identifying CHD patients overdue for follow-up and reach out to them	1. Identify forgotten CHD patients mine data including STS Registry, echocardiograms, diagnosis and billing history 2. Classify CHD patients by diagnosis and repair status and clinic/provider 3. Prioritize 4. Enable Follow-up	> 14,000 patients identified > 1,000 follow-ups scheduled > 300 interventions ordered > \$7million revenue

PUBLISHED:

- A Data Mining Tool and Process for Congenital Heart Defect Management in *American Medical Informatics Association*
- System to Identify, Classify and Manage Patients with Structural Heart Defects in *Quality and Productivity Research Conference 2019*

Can also be applied to:

- Any long-term chronic disease where patients may be overdue for assessment
- Adult structural heart defects

Demo



Supervised Learning for CHD

- Supervised learning is an approach to creating artificial intelligence, where the program is given labeled input data and the expected output results.

Supervised learning can be used to improve algorithms, such as the CHD use case

- Design workflows for following up identified patients
- Allow providers to review the patient charts, prioritize and assign follow-up dates
- For patients who come to cardiology follow-ups, track whether further intervention was ordered
- Reprioritize identified patients based on learning feedback from #2 (how soon the chosen follow-up date was) and #3



Denials

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[Denials tool helps health care systems improve revenue cycle efforts \(rsmus.com\)](https://rsmus.com)

Reducing Length of Stay

Reducing Length of Stay

Length of stay is the biggest factor for inpatient cost.

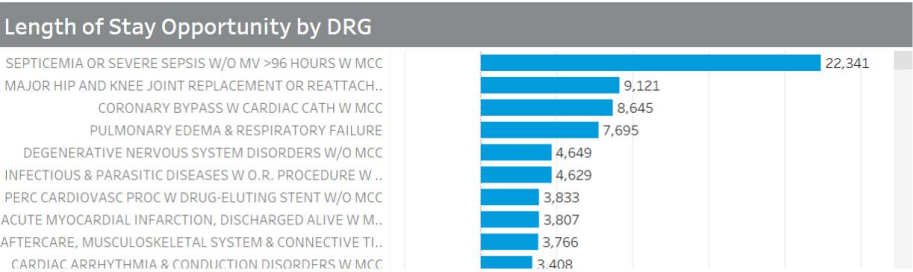
There are two fundamental ways to reduce LOS

1. Be more efficient
 - Reduce Wait Times (ED boarder, PACU boarder, Discharge)
2. Cure patients faster
 - Disease Care Paths ▪ Reduce Complications

The first step is identify opportunities

- What diseases have greatest length of stay opportunity?
- What units or processes have inefficiencies?
- What complications are affecting length of stay?

Demo



Efficiency

Efficiency and Patient Movement

- Track all patient movements
- Forecast expected patient movements
- Measure patient movement time
 - By origination, target, day, time, service
- Identify delays and patterns
- Causal analysis: What is causing delay?
 - Lack of capacity?
 - Waiting on another event?
 - Process?

Use Cases

Discharges

- Order wheelchairs and walkers prior to discharge order

ED

- Improve sepsis care by creating ED lab
- Reduce overflow by predicting volumes 72 hours ahead

Admissions

- Predict capacity issues ahead of time
- Reduce number of people waiting for a bed from 78 to 24 a day

ICU

- Reduce number of patients waiting for ICU bed by 33%
- Create capacity by designing ICU observation area

Transfers

- Reduce transfer cancellation rate by 40%

Digital Twin

- Use discrete event simulation to test what-if scenarios and optimize resource allocation

Case Study: Predicting ED Arrivals and Occupancy

PROBLEM: Emergency Department overfills causing long delays and emergency procedures to create occupancy

GOAL: Predict high occupancy in the emergency room to allow mitigation efforts

APPROACH:

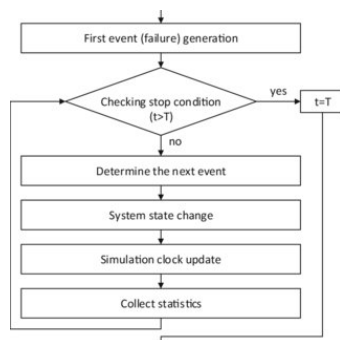
1. Obtain historical data for emergency room patients
2. Augment data with local weather, holidays and events data
3. Predict ED arrivals
 - Evaluate and choose features and algorithms, train and test
 - Chosen features: day of week, time of day, date, temperature, relationship to holidays
4. Predict ED length of stay for patients in the ED using statistics
Based on partial information from: service, date, time, diagnosis, ED events
5. Predict future occupancy
This is a calculation using predicted ED arrivals, current occupancy and predicted ED length of stay for current patients

RESULTS:

Able to predict overflow as Yellow, Orange or Red (previous was just red)
Alerts up to 96 hours ahead
78% accuracy at 72 hours

Discrete Event Simulation

Discrete Event Simulation



- Simulation: the process of mimicking the behavior of real systems
- Why simulate?
 - To perform “what if” analyses...
 - Without impacting current operations
 - At lower cost, in less time
 - If process is too complex
 - Over many scenarios

Case Study: Digital Twin

- **PROBLEM:** Adding resources or demand in one area of a hospital can cause bottlenecks in other areas.
- **GOAL:** Analyze resource constraints and what-if scenarios to predict bottlenecks, occupancy and length of stay. Use this analysis to optimize resource allocation
- **APPROACH:**
 1. Map the resources (beds, imaging machines, etc)
 2. Fill in what each resource can support (patient type, movement) through data profiling and manual review
 3. Extract the clinical treatment plan from historical encounters
 4. Randomly push patients/treatment plans through the hospital to test resource constraint usage, bottle necks, throughput
 5. Allow resources to be edited to test what if scenarios

PUBLISHED:
Predicting Hospital Capacity and Efficiency
in *11th International Conference on Health Informatics*

Can be applied to:

- Beds
- Staffing
- Imaging resources
- Clinics
- Operating Rooms

Surgical Efficiency

The perioperative suite is one of the busiest areas of the hospital, generates the most revenue and incurs the highest costs. Therefore, throughput and efficiency are vitally important.

SOME OF THE IMPORTANT KPIS TO TRACK EFFICIENCY INCLUDE:

- ✓ On-time starts
- ✓ Cancellations
- ✓ Add-ons
- ✓ Turnover and turnaround times
- ✓ PACU boarding times
- ✓ Case duration accuracy



Through analytics we can monitor the efficiency and also look for causes of inefficiencies.

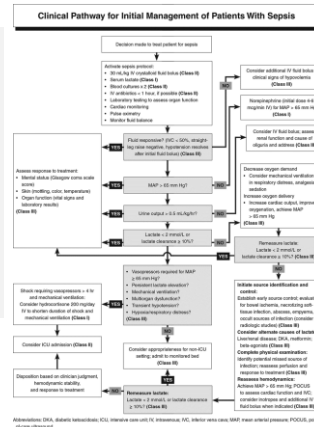
Demo



Care Paths

Standardized Care Paths

- Best practice care pathways can be found as flow charts and decision points in literature.
- Pathways are defined for both acute encounters and chronic disease treatment.
- Standardized analytics apply across all of the care pathways.
- These processes can be implemented and tracked and measured using standardized technology and process intelligence engines
- PUBLISHED:
- Accelerating Analytics for Clinical Pathways to Drive Cost Reduction and Quality Improvement in *IEEE International Conference on Information Reuse and Integration (IRI)*



Inpatient Quality: Target Analytics by Care Path

Heart Failure	Sepsis	Sickle Cell Anemia
Stroke	Pneumonia	COVID-19
Acute Coronary Syndrome	Asthma	COPD
Colon Surgery	Preeclampsia	NICU Vent Weaning

Use Case: Congestive Heart Failure

Protocol	Identification chief complaint, temperature, blood pressure, pulse Evaluation blood labs, EKG, chest x-ray, BNP Treatment Diuretics, oxygenation, weight management Follow up
	↓ LOS 1.5 days ↓ Direct cost 16% ↓ Readmission 22% ↓ Mortality 60%
Results	
Pubs	- Improving Patient Care Through Analytics in <i>ISCB</i> - Accelerating Analytics for Clinical Pathways to Drive Cost Reduction and Quality Improvement in <i>IEEE IRI</i>

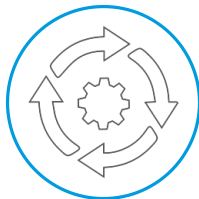
Significant improvement achieved with second iteration

Process Intelligence

What is Process Intelligence?

Process Intelligence platform designated to empower business users to understand, optimize, monitor and predict clinical process of any type,

Discovery & Mapping



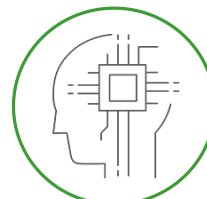
- Mine event streams from multiple sources, such as NetSuite, for organizations
- Generate a real-time interactive "as is" view of the business process

Analysis & Organization



- Analyze complete business processes to find root cause of problems
- Data visualization to discover patterns and insights to better customer experience

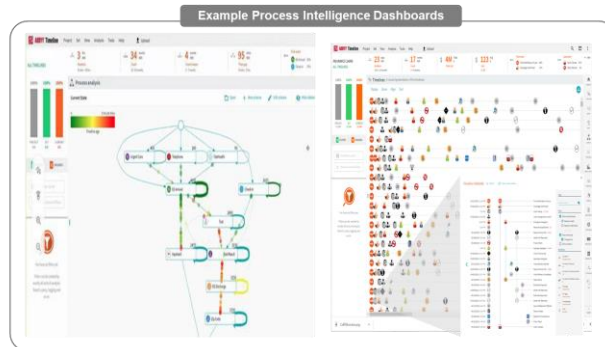
Prediction & Forecasting



- Apply advanced artificial intelligence and machine learning to predict and forecast processes into the future
- Perform cost analysis
- Optimize business operations through real-time monitoring

Process Intelligence Use Cases for Health Care

- Patient Movement
- Emergency Department Flow
- Care Paths



21

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Process Intelligence Benefits

				
Data Driven Discovery	Immediate Insights	Automation Optimization	Digital Alignment	Continuous Value Creation
• Where processes are driven by your data, RSM can digitally map processes making discovery less invasive and time consuming	• Identification of process breakdowns • Locating shadow loopholes and 'busy work' bottlenecks • Understand root cause opportunities	• Provides an agile workforce and technology environment • Enables growth and automation, at any speed, at every stage	• Aligns IT strategy & investments • Complimenting versus competing business priorities and system technologies	• Creates a process for continuous advancement & monitoring • RSM clients find PI monitoring as the go-to solution for consistent value creation without the overhead

Staffing Optimization

Optimize Staffing

Challenges

- Shortage of nurses
- Increased compensation
- Travel and nurses are expensive
- Nurses are overworked
- Volatility in sick calls

Solutions

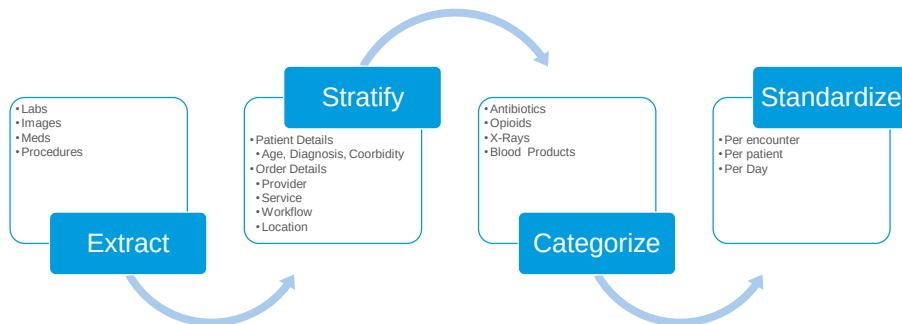
- Combine EMR data with scheduling, time & attendance and HR
- Forecast nursing needs more accurately
- Schedule nurses more optimally
- Improve nursing retention

Utilization

Reduce Clinical Variation, Save On Costs: DO MORE WITH LESS

Unwarranted clinical variation refers to medical practice pattern variation that cannot be explained by illness, medical need, or the dictates of evidence-based medicine. It is one of the causes of low value care often ignored by health systems.

- Our challenge is to **identify clinical variation** and **analyze if it is warranted**.



CASE STUDY:
Congestive Heart Failure (CHF)

GOAL	APPROACH	RESULTS
Optimize CHF order set	- Analyze all orders utilizing the CHF orderset - Analyze all orders for CHF patients which do not utilize the CHF Orderset	As part of this analysis, we learned that a full narcotics screen was being ordered for 95% of CHF patients. Our data showed no clinical usage of the results of this lab, and we then verified this with providers. The cost of the narcotics screen was \$309. We removed the narcotics screen from the default list of orders in the CHF orderset.

Can also be applied to:
Any orders

CASE STUDY:
POKE-R

PROBLEM	GOAL	APPROACH	RESULTS
PICU patients receive lots of "pokes," increasing cost, reducing patient experience and causing hospital acquired infections	Provide information to providers to allow reduction of poke	- Define a poke Identify which orders count as "pokes" including blood labs, IV medications, radiology and invasive procedures. - Present poke information to providers – including: - Past pokes and scheduled pokes - Cost information - Insure data is available during structured rounds	12.5% reduction in pokes 5 year savings \$11,058,085 in 26 bed PICU

PUBLISHED:

- Avoiding Pain and Unnecessary Interventions and Reducing Cost in the PICU in *Critical Care Medicine*
- Poke-R - Using Analytics to Reduce Patient Harm in *10th International Conference on Health Informatics*

Can also be applied to other ICUs including:

- NICU
- SICU
- MICU

CASE STUDY: Blood Utilization

PROBLEM	GOAL	APPROACH	RESULTS
Patients sometimes receive blood transfusions when not clinically required. This causes adverse outcomes.	Reduce unnecessary red blood cell transfusions, improve outcomes, reduce cost	1. Evaluate the clinical necessity of blood transfusions based on hemoglobin, base deficit, blood pressure, scvO₂, lactate, blood loss, diagnosis 2. Analyze blood wastage and returns 3. Provide information for provider evaluation 4. Use supervised learning to adjust thresholds based on provider evaluations	• \$3.3 million annual savings • 23% fewer units • 46% fewer non-indicated units

PUBLISHED:
Reducing Red Blood Cell Transfusions in *International Conference on Information Technology in Bio- and Medical Informatics (ITBAM)*

Can also be applied to other products including:

- Plasma
- Platelets

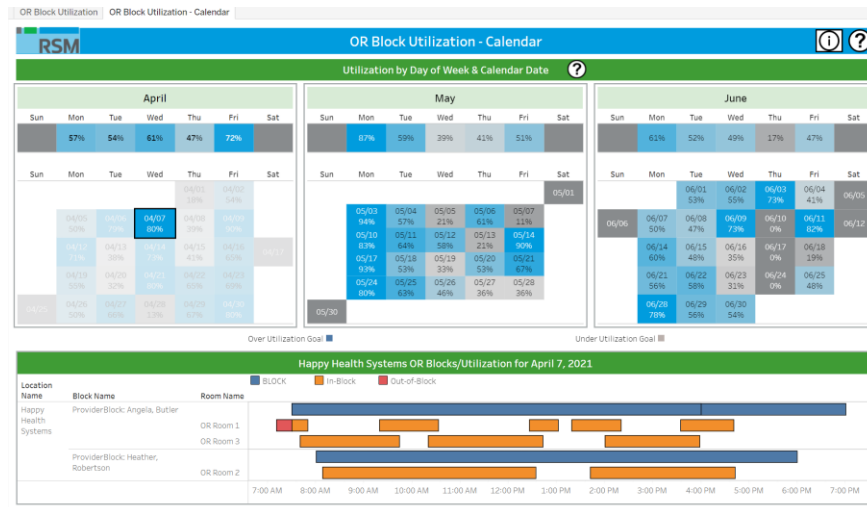
CASE STUDY: Operating Room Utilization

PROBLEM	GOAL	APPROACH	RESULTS
Operating rooms are sometimes empty and sometimes overbooked and open after hours. Some surgeons do not have enough operating room time available and others need more time. Disruption from COVID-19 has magnified these issues	Increase the amount of the operating room is full and decrease the amount of time the operating room is staffed and empty. Optimize block allocations to the changing needs of surgeon groups.	1. Track room utilization by hour to optimized staffed hours and volume. 2. Analyze anesthesia usage and out-of-room staff utilization across surgical and procedural suites to monitor resource constraints. 3. Analyze service and surgeon block utilization, including: block utilization, block releases, overbooks, unblocked utilization, scheduling patterns	• 12% higher service block utilization • 29% fewer empty staffed rooms • 25% lower out of block minutes

Can also be applied to:

- Endoscopy
- Cath Lab
- Electrophysiology
- Interventional Radiology
- Complex Imaging

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Patient Experience

Patient Experience

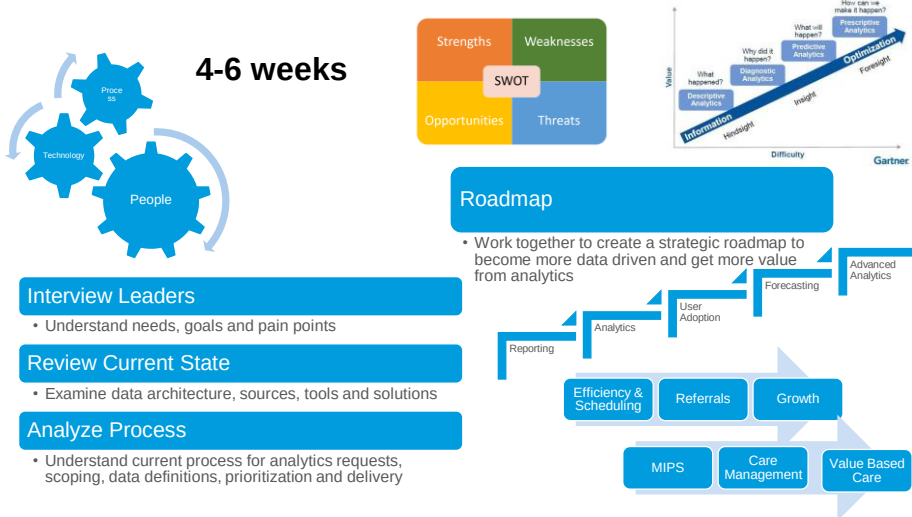
- Most hospitals and providers survey patients and track overall scores
- What is causing patient experience scores to be high or low?

Joining EMR data with patient experience data can allow us to dig into questions by the following to really provide insight into what makes patients have a better experience:

Disease	Unit	Provider
Service	Age	Demographics
Treatment	Pain Level	...

Getting Started

Analytics Health Check Assessment



Questions & Answers

Q&A

Let's Connect!

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