



Cloud Analytics As A Service

Enabling Actionable Real-time Data Analytics

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HiMSS

CENTRAL & SOUTHERN OHIO Chapter

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Wood County Hospital

Founded in 1951, Wood County Hospital (WCH) is a private, not-for-profit general acute care facility, licensed for 196 beds, that serves a population of over 72,000 in Wood, Henry, Seneca, Sandusky and Hancock counties in Northwest Ohio.

Achieved Meaningful Use Stage 2 Year 2 attestation, a recipient of HIMSS Stage 6 designation in 2015. A Most Wired Hospital recipient in 2015 & 2016. Wood County Hospital is fully accredited by the Joint Commission on Accreditation of Health Care.

Medical Staff Members: 270
Total Patient Days: 10,012
Annual Admissions: 4,706
Annual Outpatients: 95,135
Annual ED Visits: 30,267

Wood County Hospital
950 W. Wooster St.
Bowling Green, OH 43402
www.woodcountyhospital.org

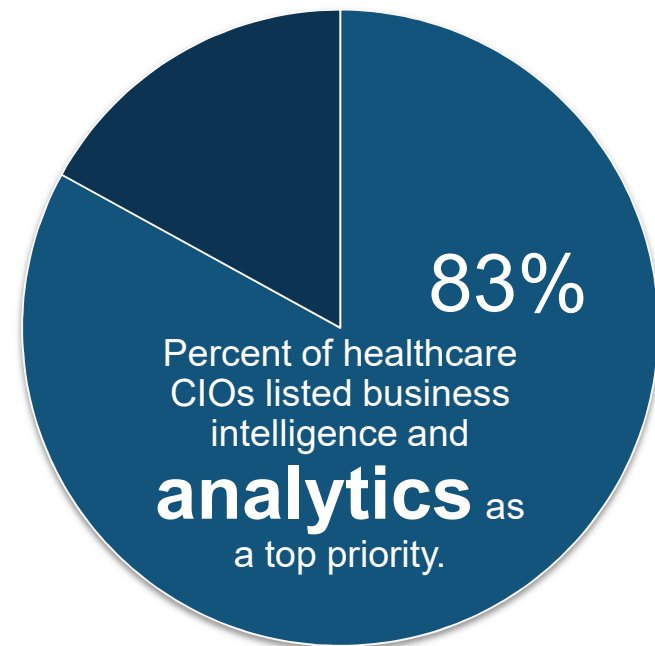
Wood County & G2 Works

Why & What's Important To Us

- BI Top Priority
- What's Next for Healthcare
- Desire to Achieve HIMSS EMRAM Stage 7

Many Vendor Options

- Healthcare Experience
- Capabilities
- Relationship
- Technology – Secure Cloud
- Vision



The Challenge

From Our Perspective...Where We Are

- Regulatory & Compliance Mandates & Changes
- Data, Data, & More Data
- No Near Real-Time Actionable Information
- Retrospective Data Analysis
- Time, People, & Money Shortage
- Time to Buy & Build
- Speed to Deploy
- Ongoing requests, maintenance, support!



The Challenge Re-Purposed

From Our Perspective...Where We Are Headed

- Speed to Adapt to On-Going Regulatory Complexity & Compliance Changes
- What Data Has Value To Drive Outcomes
- To Measure Factors & Outcomes to Drive Actions
- Near Real-Time to Real-Time Actionable Information
- Actionable Findings - Tactical & Strategic
- Optimization of Available Resources
- Scalable Service & Platform Enabling BPO



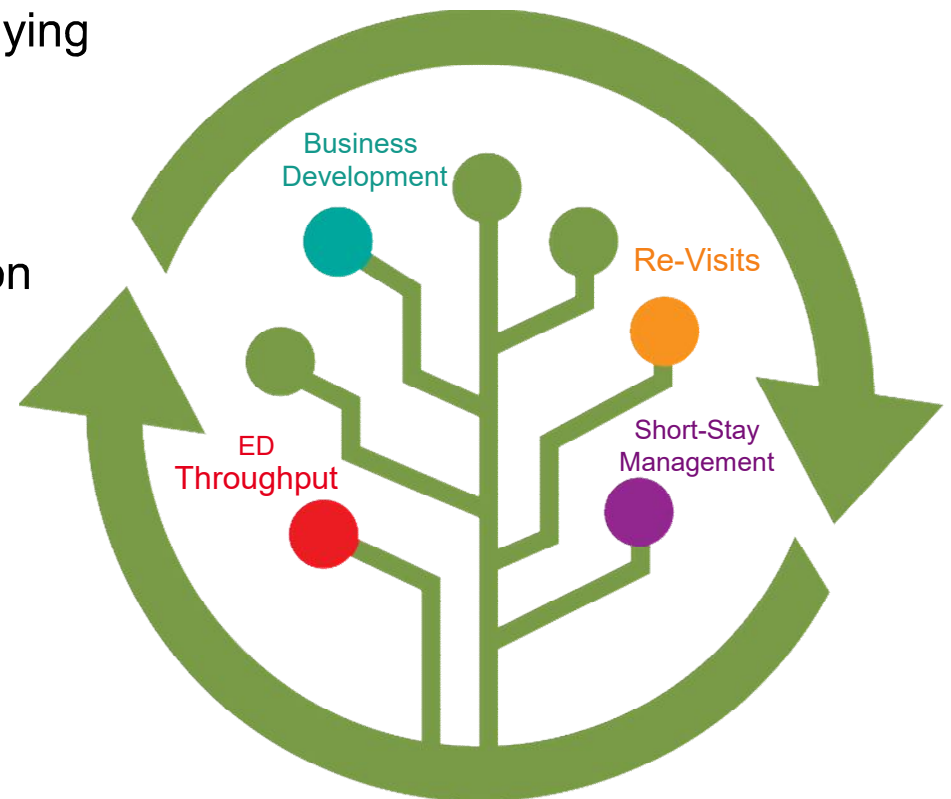
Quality Requires A Consistent Drive to Improve!

Cloud Analytics: The Power's In The Platform



Libraries & Applications

- Near Real-Time Analytics (~15min)
- Visual Learning “Cues” w/Underlying data
- Enables Action vs. Reaction
- Ensures Effective Communication
- Reduce Duplication of Effort
- Visibility During Off Hours
- Monitor Performance



What if you're not learning from your data?



It's like driving up a steep cliff on a hairpin turn. It's dangerous!!

The Future: Machine Learning

Machine learning is a subfield of computer science that evolved from the study of pattern recognition and computational learning theory in artificial intelligence. In 1959, Arthur Samuel defined machine learning as a *"Field of study that gives computers the ability to learn without being explicitly programmed"*.

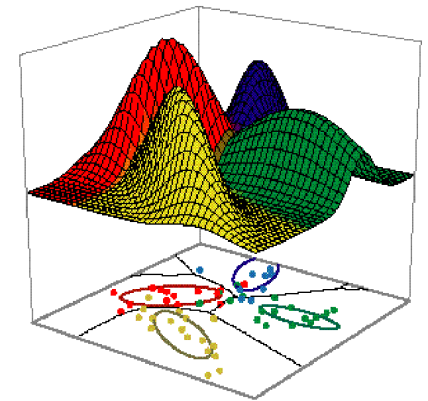


Source: https://en.wikipedia.org/wiki/Machine_learning

The Future: Visual Discovery & Machine Learning

What's the benefit of a learning system?

- If outcomes are dependent on more than a few factors:
 - How do I know which factors to go after first for the greatest impact at lowest cost?
 - Should I chart those factors with my BI tools and work to control outliers through a process improvement program?
 - How effective is this approach?
 - Which outliers shall we focus on?
 - What happens to the process improvement result if there is a change in the system such as staff, diagnosis profile, resources, etc.?
- Is there a way to know, in real-time, when a poor outcome is likely in order to affect the outcome?

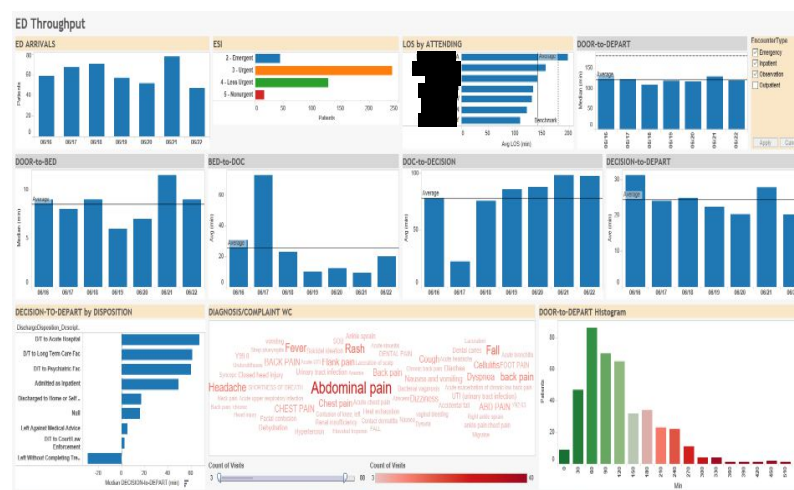


EDT: FY 2017 ED LOS Pay for Performance

IQR Program Finalized Measures

Emergency Department (ED) Throughput Measures

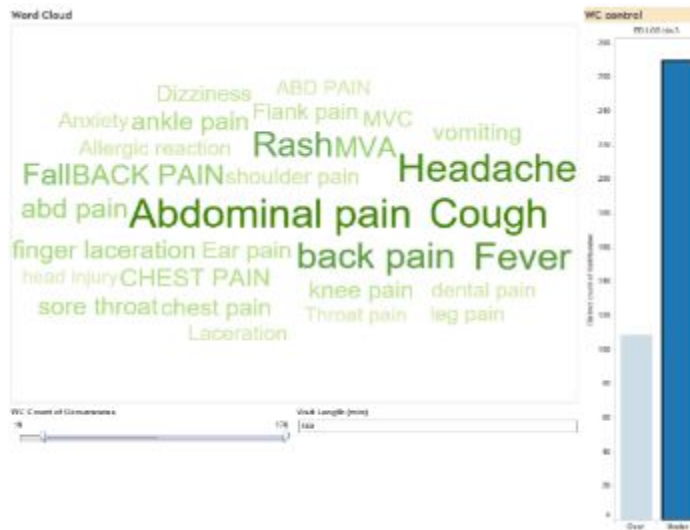
- ED-1 Median time from ED arrival to ED departure for admitted ED patients★ (NQF #0495)
- ED-2 Admit Decision Time to ED Departure Time for Admitted Patients ★(NQF #0497)



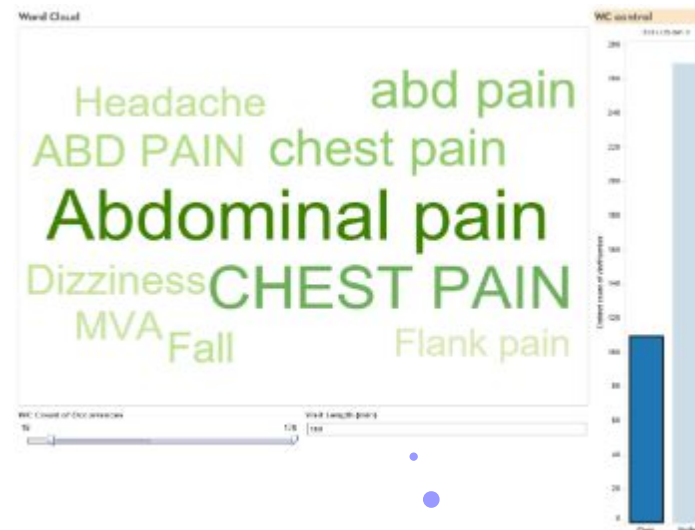
Visual Discovery

What Complaints Dominate Longer Stays?

Shorter Stays



Longer Stays

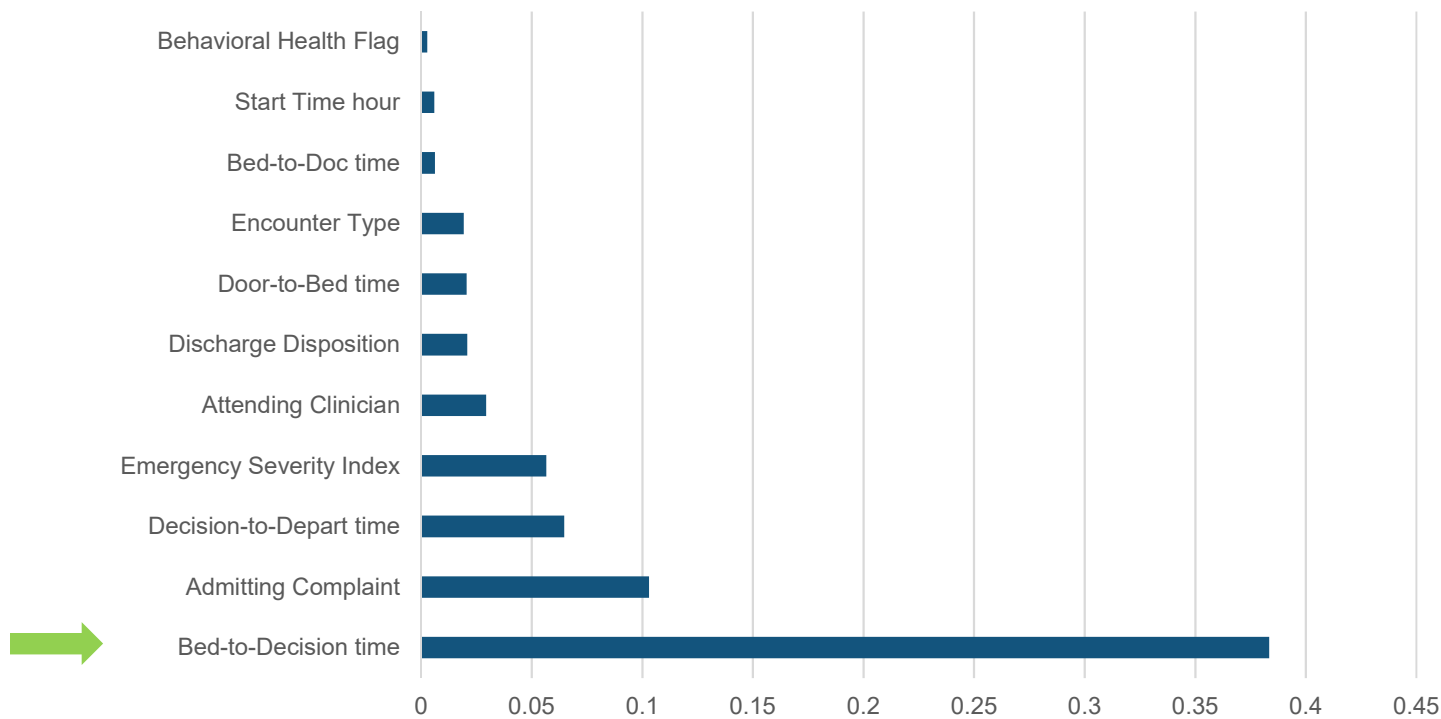


Abdominal & Chest Pain

Machine Learning

Where do we look first?

LOS > 180 Predictive Finding



Visual Discovery

Display High Impact Findings Up Front

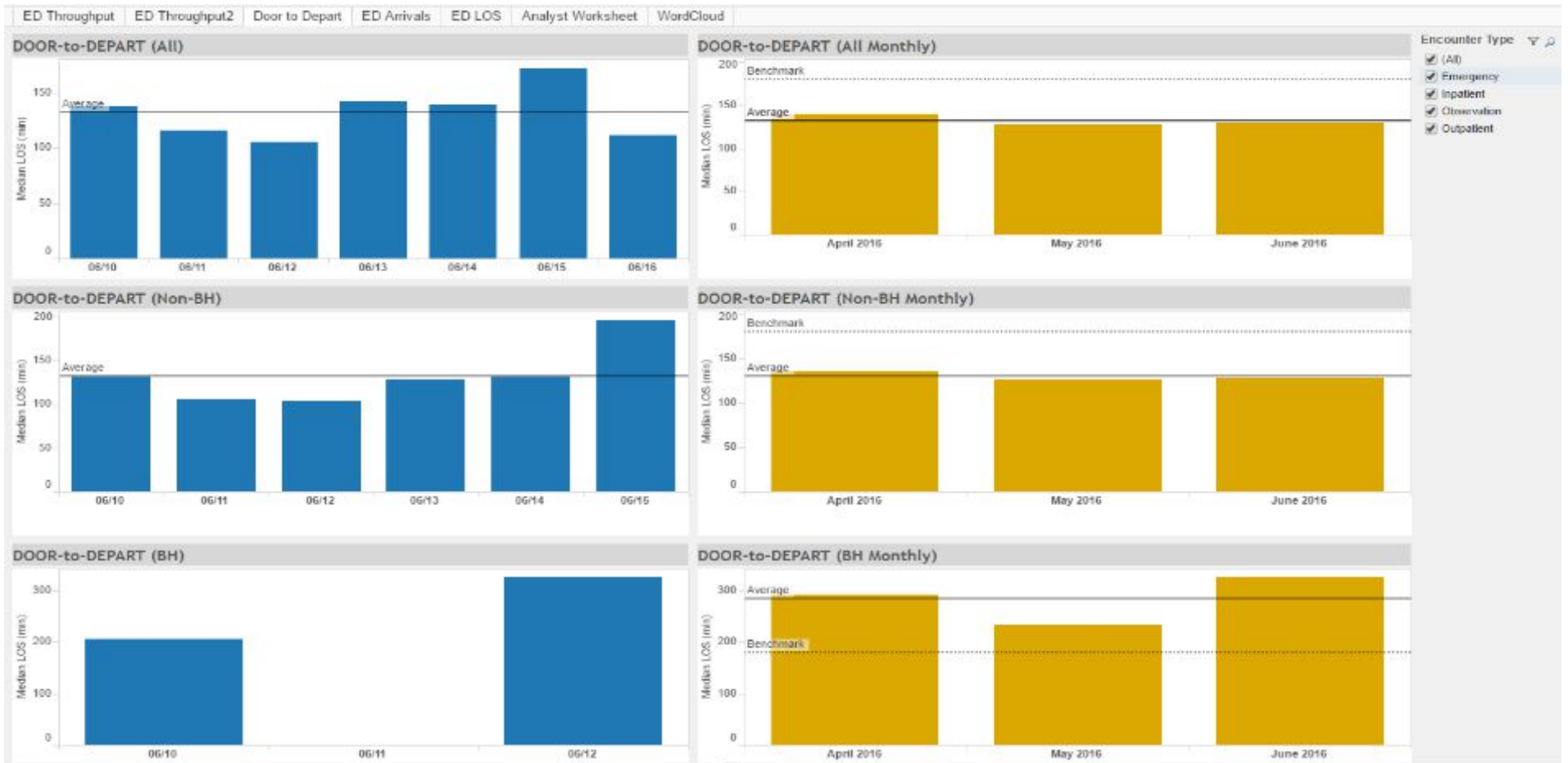


Visual Discovery & Machine Learning

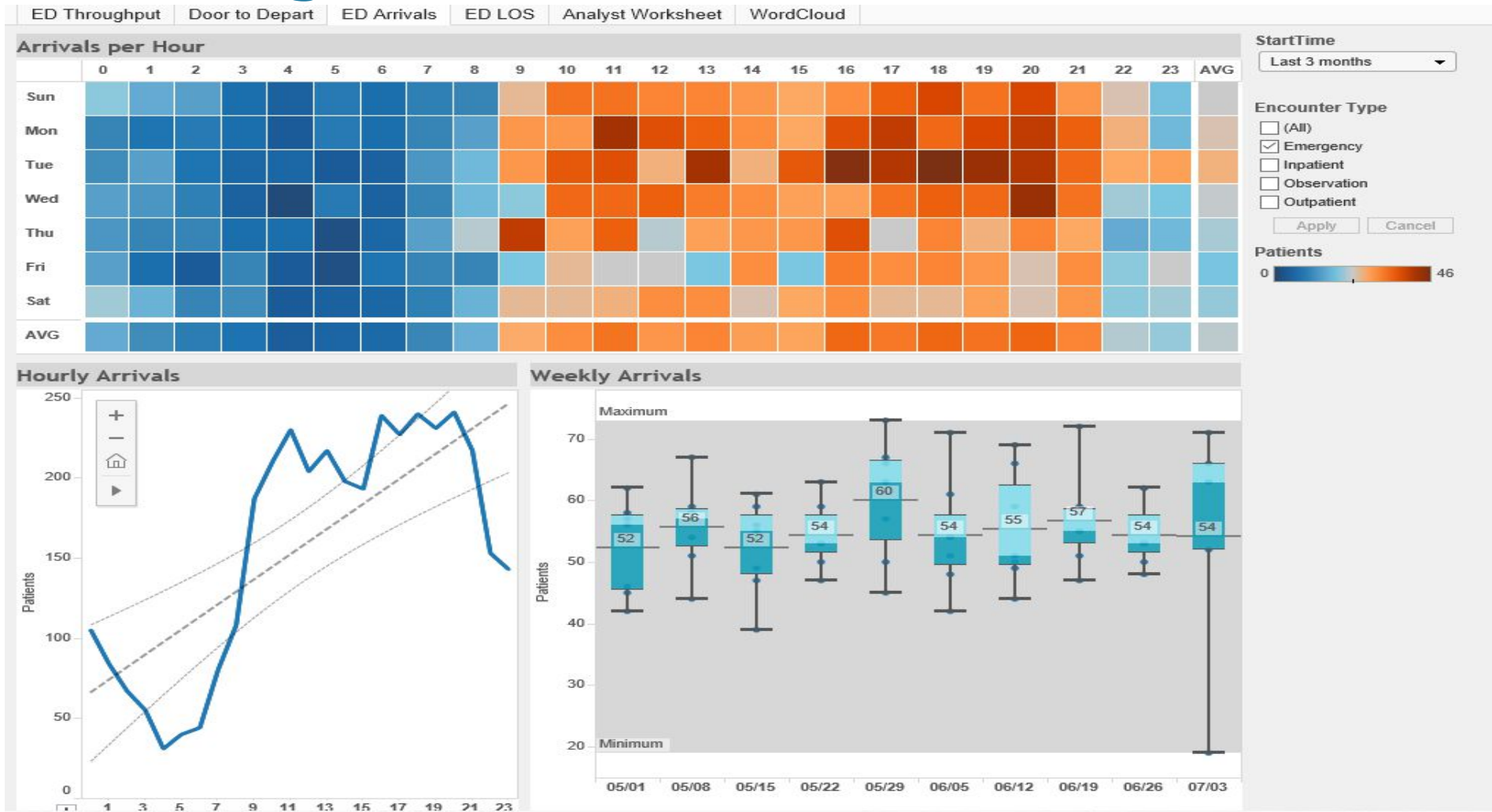
Display High Impact Findings Up Front - New



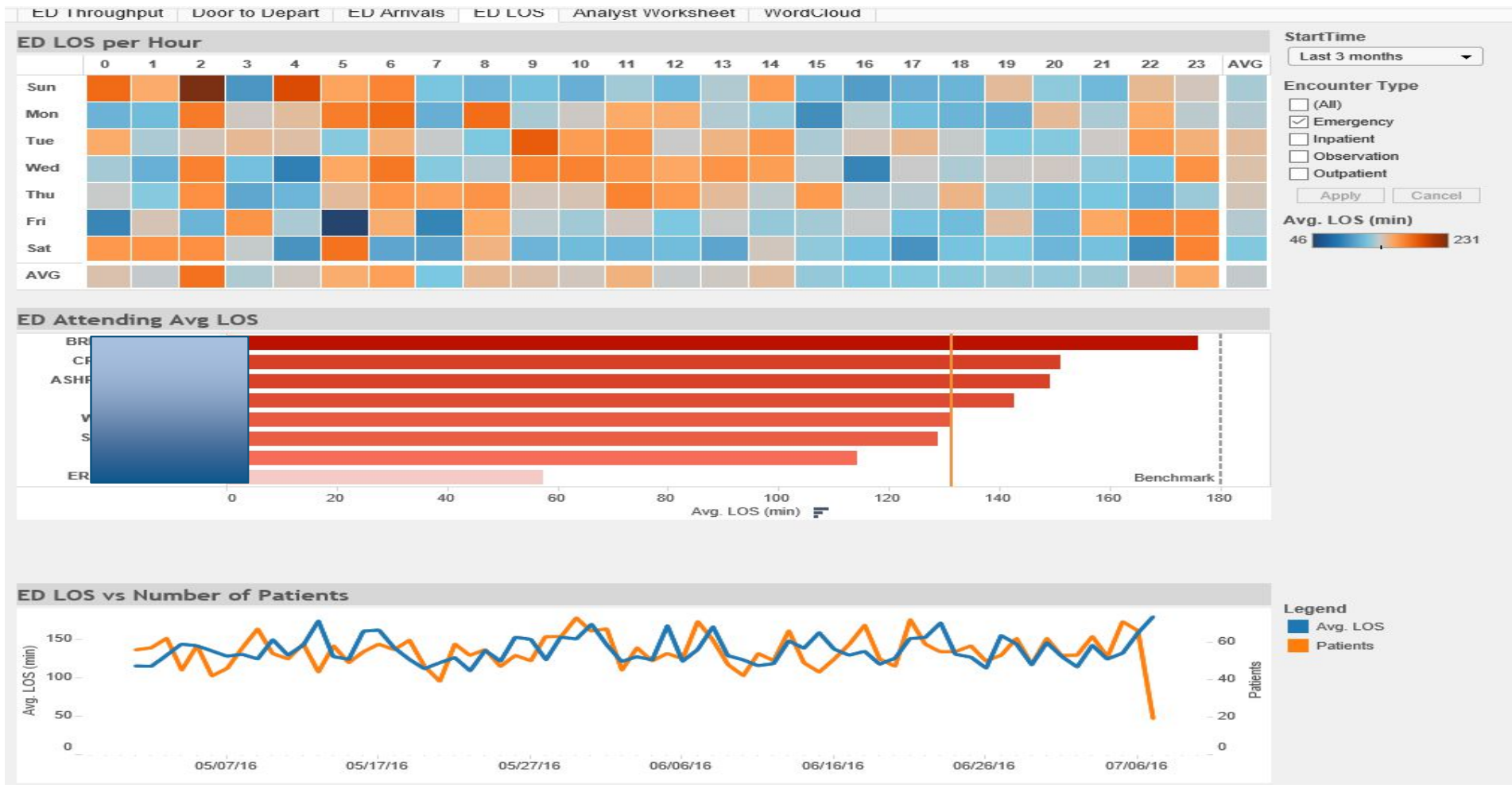
Are Quality Measures Under Control?



How Do Arrivals Per Hour Affect LOS & Staffing Needs?



How is Length of Stay Related to Arrival Time?



Monthly Reporting: Now Daily

Ed Volumes	Admissions p1	Admissions p2	LOS Measures	Boarded Holds	Median Throughput Markers	All
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Admissions & Observations - page 1

EIO# (Emergency, Inpatient, Observation)		January	February	March	April	May	Grand Total
2016	Emergency	1,521	1,842	1,973	1,825	828	7,989
	Inpatient	148	146	146	127	43	610
	Observation	102	117	98	91	31	439
	Outpatient	4	2	2	4	4	16

EIO%		January	February	March	April	May	Grand Total
2016	Emergency	85.69%	87.42%	88.91%	89.15%	91.39%	88.24%
	Inpatient	8.34%	6.93%	6.58%	6.20%	4.75%	6.74%
	Observation	5.75%	5.55%	4.42%	4.45%	3.42%	4.85%
	Outpatient	0.23%	0.09%	0.09%	0.20%	0.44%	0.18%

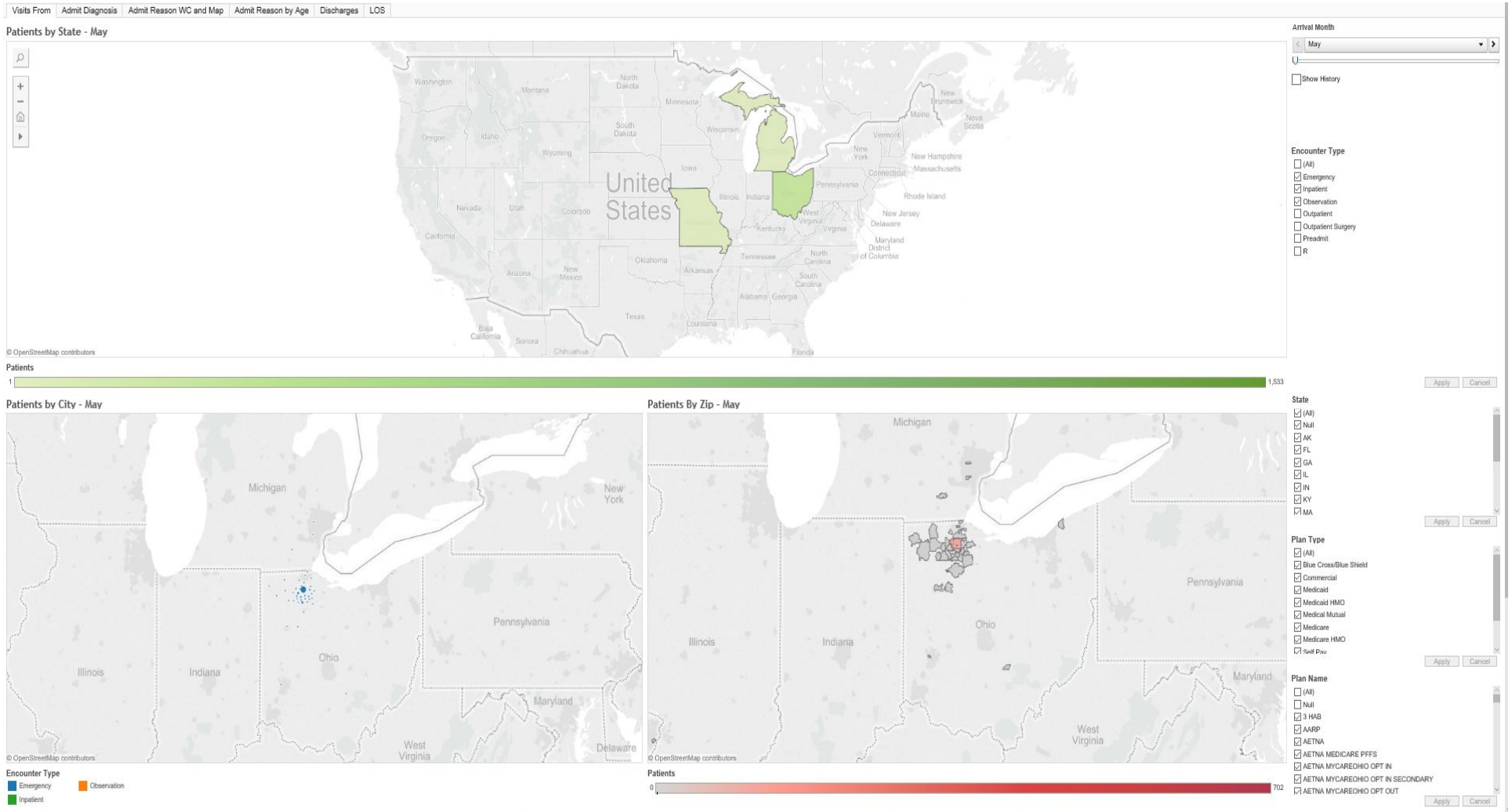
Discharge Disposition#		January	February	March	April	May	Grand Total
2016	Decision_Discharge Patient	1,036	1,972	2,137	1,961	854	7,960
	Decision_Discharge to Home When Patient M..	1	6	12		2	21
	Decision_Discharge When Patient Meets Crit..	1					1
	Decision_ED to OPS	4	3	6	5	2	20
	Decision_Inpatient to Observation	23	25	32	29	10	119
	Decision_Observation to Inpatient	18	31	34	19	12	114
	Decision_Place in Status Inpatient	90	148	148	142	42	570
	Decision_Place in Status Observation	71	126	104	85	38	424
	Decision_Transfer Patient to	55	108	105	93	35	396

The Future Applied: Visual Discovery & Machine Learning

Example Key Findings NQF#0495 - Median time (in minutes) from ED arrival to ED departure for patients admitted to the facility from the ED.

- 68% of ED patient stays leading to a hospital admission are shorter than 180 minutes.
- Patients with Abdominal Pain are 18X more likely to have an ED stay longer than 180 minutes.
- If Abdominal Pain visits were removed from the mix, 85% of ED patient stays leading to a hospital admission are shorter than 180 minutes.
- If Abdominal Pain and Chest Pain visits were both removed from the mix, 96% of ED patient stays leading to a hospital admission are shorter than 180 minutes.
- Visits where a lab test of CRP are ordered are 16x more likely to have an ED stay longer than 180 minutes.

Patients & Service Lines: Understanding Demographics



Service Lines: Understanding Admitting Complaints and Demographics

Visits From | Admit Diagnosis | Admit Reason WC and Map | Admit Reason by Age | Discharges | LOS

Word Cloud

back pain, abd pain, head injury, dizziness, dental pain, shoulder pain, abdominal pain, vomiting, headache, fever, MVC, vaginal bleeding, chest pain, cough, rash, sore throat, allergic reaction

Count of Admit Reason

2 79

Zip Map - April

Perms

Count of Patients

0 777

Arrivals Month

Jan
 April
 May

Apply Cancel

Word Count Range

2 79

Encounter Type

All
 Emergency
 Inpatient
 Disposition
 Outpatient
 Outpatient Surgery
 Transfer In

Apply Cancel

Admission Source

All
 Mail
 Don Inside the Hospital
 Don Outside the Hospital
 Clinic Referral
 Court or Enforcement
 Emergency Room
 Information Not Available
 Readmission to Same H...
 Self Referral
 Transfer from a Critical...
 Transfer from a Hospital
 Wound Care Physician

Apply Cancel

Plan Type

LAB

Plan Name

LAB

Patients: Understanding Admitting Complaints and Demographics by Age

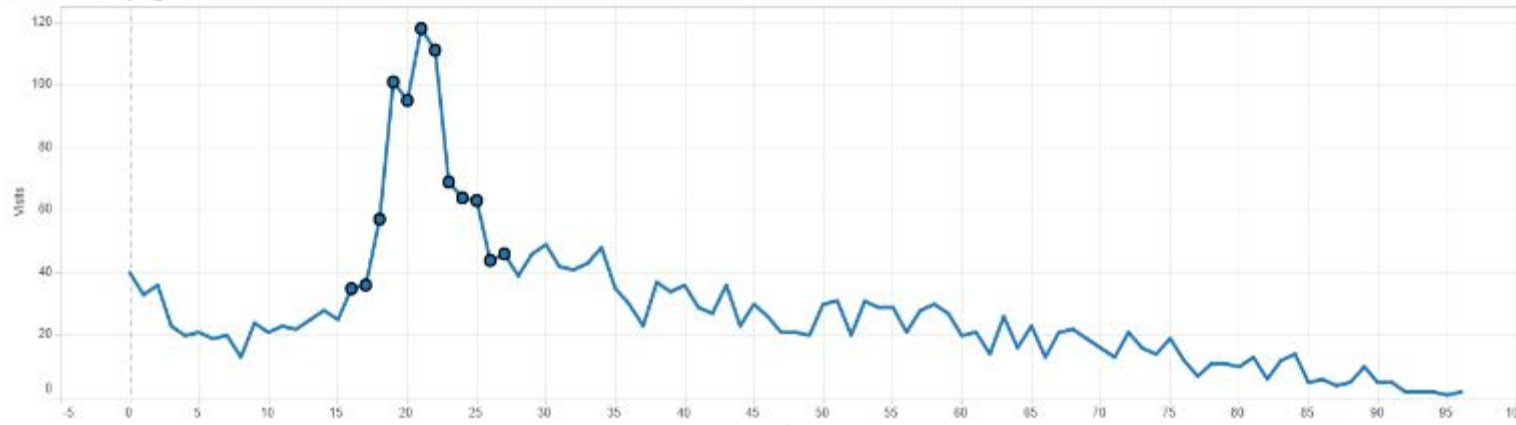
Word Cloud



Count of Admit Reason



Visit Counts by Age



Arrivals Month

(All)
 April
 May

Word Count Range

Encounter Type

(All)
 Emergency
 Inpatient
 Observation
 Outpatient
 Outpatient Surgery
 Preadmit
 R

Admission Source

(All)
 Null
 Born Inside the Hospital
 Born Outside the Hospital
 Clinic Referral
 Court/Law Enforcement
 Emergency Room
 Information Not Available
 Readmission to Same H...
 Self Patient
 Transfer from a Critical A...
 Transfer from a Hospital
 Wound Care Physician R...

Plan Type

Insurer Description

Patients: Complaints and Possible Revenue Leakage

Visits From Admit Diagnosis Admit Reason WC and Map Admit Reason by Age Discharges LOS

Word Cloud

Count of Admit Reason: 2

Discharge to - April

DischargeDisposition Descript..	DischargeLocation Description	AttendingClinician Description	
D/T to Acute Hospital	Flower Hospital	SA	
	St. Vincent Hospital	AS	
		SA	
		ST	
	Toledo Hospital	MC	
D/T to Court/Law Enforceme..	Home	WH	
	D/T to SNF	Altera Sterling House of Bowl..	SA
		Bowling Green Manor	WH
Discharged to Home or Self Care	Home	JAY	
	Null	AD	
		AH	
	AT		

Count Range: 2 177

Encounter Type

- (All)
- Emergency
- Inpatient
- Observation
- Outpatient
- Outpatient Surgery
- Preadmit
- R

Apply Cancel

Admission Source

- (All)
- Null
- Born Inside the Hospital
- Born Outside the Hospital
- Clinic Referral
- Court/Law Enforcement
- Emergency Room
- Information Not Available
- Readmission to Same Ho...
- Self/Patient

Apply Cancel

Plan Type: (All)

Plan Name: (All)

DischargeDisposition

- (All)
- Null
- Admitted as Inpatient
- D/T to Acute Hospital
- D/T to Court/Law Enforce...
- D/T to Home Health
- D/T to Inpt Rehab Fac
- D/T to Intermediate Care

Re-Visits: 30 Day and 72 Hour

Word Cloud 30 Day Readmits



Visits per Patient
select patients to view admitting reasons.



Status ■ Discharged 1-72 ■ Discharged ■ Current Patient 24 ■ Current Patient 72

Encounter Type

- (All)
- Emergency
- Inpatient
- Observation
- Outpatient
- Outpatient Surgery
- Preadmit
- R

Apply Cancel

Admission Source

- (All)
- Null
- Born Inside the Hosp...
- Born Outside the Hos...
- Clinic Referral
- Court/Law Enforcement...
- Emergency Room
- Information Not Avail...
- Readmission to Sam...
- Self/Patient
- Transfer from a Pri...

Apply Cancel

Visit Count

2

Plan Type

- (All)
- Null
- Blue Cross/Blue Shield
- Commercial
- Medicaid
- Medicaid HMO
- Medical/Mutual
- Medicare
- Medicare HMO
- Self Pay

Apply Cancel

Insurer Description

(All)

Lessons Learned & Future Endeavors

Lessons

- Understand Workflows and Data Generated
- Data Validation, Data Validation, Data Validation
- Data error rate ~0.5% - Input by Humans
- Visualization & Machine Learning Output = New Language
- Adoption – New Language Requires Time

What's Next

- Rad & Lab PI – LOS Impact
- EKG Turnaround – LOS Impact
- Clinic(s) Throughput
- Orthopedic Bundling
- 2017 Quality Measures
- Medicare Access and CHIP Medicare Access and CHIP Reauthorization Act (MACRA)

...and then...in parallel...

Implementing Workflow Changes While Monitoring & Measuring Impact/ROI



What Questions Do You Have...

