Market Dynamics Continuing to Affect Lab Testing

Enhanced Patient & Provider Experience

Improved Quality of Care

Lowered Cost

Improved Outcomes
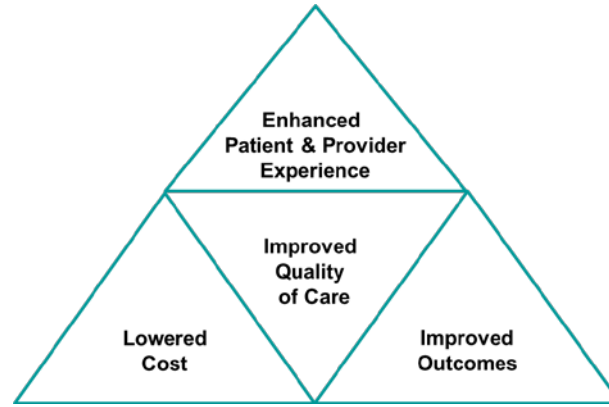
| Value Based Healthcare and Value Modifiers | Readmission Reduction | Hospital Acquired Condition Reduction | HEDIS** | MACRA & MIPS* | Protecting Access to Medicare Act (PAMA) |

*Medicare Access and CHIP Reauthorization Act (MACRA) and Merit-Based Incentive Payment System (MIPS)

** Healthcare Effectiveness Data & Information Set (HEDIS)

Value-Based Healthcare and Alignment to Lab 2.0 Reduces Cost

| Domain	Individual Measures
Safety (weighted 25%)	• Catheter-Associated Urinary Tract Infection (CAUTI) • Central Line-Associated Blood Stream Infection (CLABSI) • C. difficile infection • MRSA • PSI-90 • Surgical Site Infections (SSI)
Clinical Care Outcomes (weighted 25%)	• AMI 30-day mortality rates • HF 30-day mortality rates • PN 30-day mortality rates
Efficiency and Cost Reduction (weighted 25%)	• Medicare Spending per Beneficiary
Patient and Caregiver Experience (weighted 25%)	• HCAHPS • Coordination

Readmission & HAI Penalties
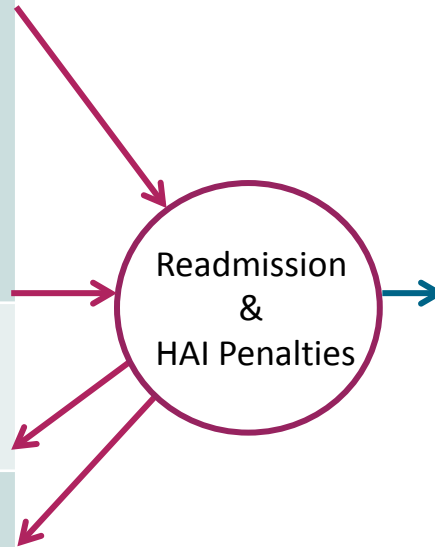
Laboratory

- Labs positioned to reduce cost, errors and readmissions:
  - Facilitating test result availability
  - Driving adoption of evidence-based and guideline compliant testing (Troponin, Procalcitonin, infectious disease testing)
  - Driving data integration and medical decision support

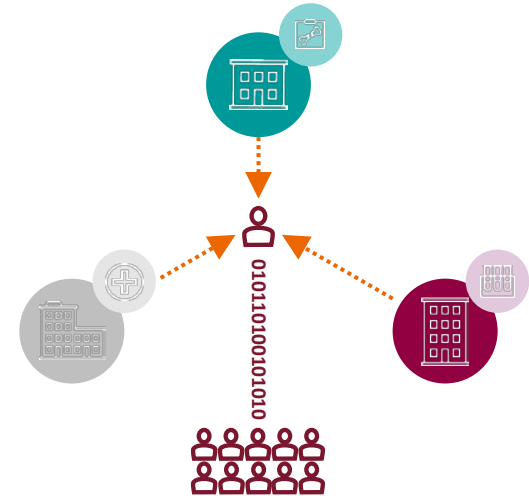# Market trends are driving the need for digitalization in Healthcare
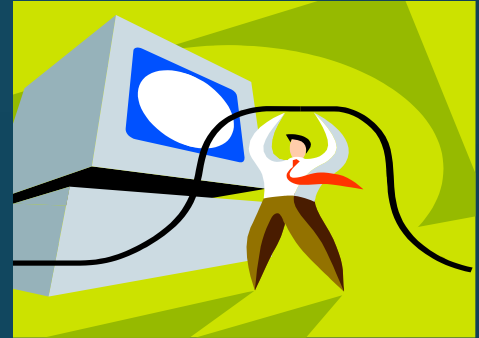

Consolidation
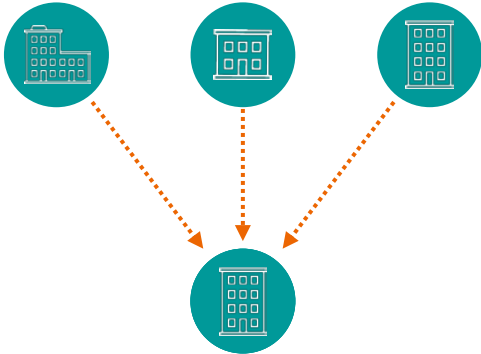
Standardization
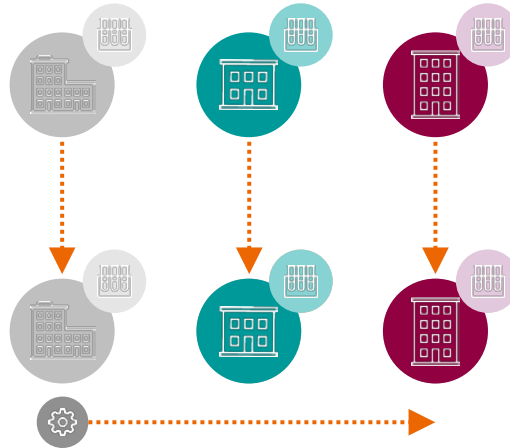
Value-based care

Driving the need for digitalization in Healthcare

Greenbelt Project to Move ER POCT to Core Chemistry platform:

"Using Lean, Middleware Analytics and New Instrumentation to Improve TAT, Cut Expenses, Improve Consistency"

Jonathan Sy Tan, MLS(ASCP)^{CM}SC^{CM}
Chemistry Technical Specialist
Columbus Regional Hospital

Columbus Regional Hospital

Jonathan Tan

Chemistry Technical Specialist

Clinical Laboratory Operations

2400 17th Street

Columbus, IN 47201

www.crh.org

- Nonprofit hospital servicing 10 counties in southern IN

- more than 2,100 employees, 225 physicians on medical staff and 250 volunteers.

- Indiana's first Magnet designated hospital for outstanding nursing care

- 255 registered beds

- Winner of the AHA's Quest for Quality Prize

- Aptio Automation with Atellica Diagnostic IT portfolio

Columbus Regional Laboratory

❑ 24/7 full service laboratory providing for:

- ❖ CRH 32 Service centers

- ❖ Inpatient admissions

- ❖ 38 Physician offices

- ❖ 8 nursing homes

- ❖ 20-bed Emergency Department

- ❖ CAP Accredited

The Event

On June 7, 2008, Columbus Regional Hospital experienced a disaster on a scale few other hospitals have survived - a flood of historic magnitude severely damaged the hospital, prompting the evacuation of 157 patients, and forcing us to close our doors for the first time in our 90 year history. The flooding caused over $180 million in damages and destroyed several critical functions, including our laboratory, pharmacy, information services, food services, and mechanical and electrical systems.

But on October 27, 2008, less than five months after the flooding Columbus Regional Hospital opened the doors to its new and improved facility and continued its commitment to excellence and serving the region.

And the process improvement journey began………

The New Laboratory

Fall 2008
- FEMA & Insurance replaced our chemistry instruments, but because of some restrictions we had to get like for like: 2 RXL Max, 2 Centaur XP
  - Add on: StreamLab Automation

- Before the flood happened the laboratory was in the process of acquiring new instrumentation

Fall 2017

The laboratory acquired new chemistry instrumentation: 2

Vista 1500, 1 Centaur XPT, Aptio Automation and the

Centralink Data Management system

Our upgraded lab equipment was long overdue. At the time of the flood we felt we were already behind the times with our solution.

Decisions, decisions…..

Because of the new integrated chemistry system and use of middleware our laboratory made the decision to improve our patient testing process

We decided to:

- Discontinue Point of Care (POC) Emergency Department testing on Stratus and Nova
- Move all Cardiac testing, Basic Metabolic Panels and Lactic acid from the lab dedicated ED POC bench to the Vistas in the core lab

Project Overview

- Workflow on the ED bench needs to be stream-lined and efficient to provide fast, consistent and high quality results to provide the best decision information to the ED providers for best patient care.

- This project is focused on creating a standard process of how specimens flow through the laboratory, utilizing the most efficient instrumentation, while balancing cost and turn-around time.

- During the flood we developed a close working relationship with the Emergency Department staff.   We decided to utilize these relationships to collaborate for better patient care.

Project Team

|	
Matt Chaille	Champion
Darcy Hill	Green Belt
Marty Dominik	Team Member
Amy Herald	Team Member
Sara Moening	Team Member
Mariah Kinman	Team Member
Marty Plascak	Team Member
Jonathan Tan	Owner
Kathy Springhorn	Owner

Green Belt Process/Steps

- SIPOC
- Murphy's Analysis
- Current Process Map
- Add Murphy's to current process map
- DOTWIMP (Waste)
- Create future process map
- Made separate maps for each specimen type
- Used maps to create Standard Work Instructions

Green Belt Project Process

| Columbus Regional Health SIPOC				
Who	What	Action	What	Who
SUPPLIERS	INPUTS	PROCESS	OUTPUT	CUSTOMERS
Patients	Doctor's orders	Receive Specimens	Lab Results	Patients
ED staff	Patient Specimens	Log-in Specimens	Quick Turn-around Time	Family Members
Lab Staff	Tracking Board	Process Specimens	Happy Doctors	Physicians
Instrument and Reagent Suppliers	Centrifuge Microscope Instrument Timers	Analyze Tests		Nurses
Lab and ED Management	Computers and Phones	Release Results		Lab staff

Kaizen Event
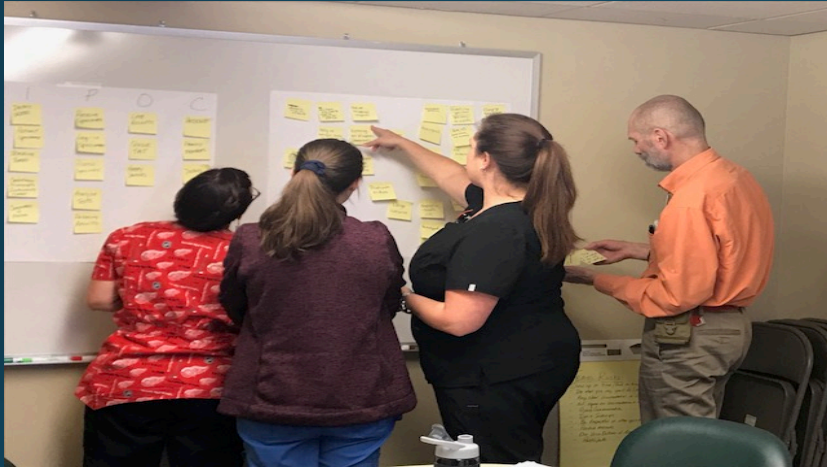
- Gathered operators, owners and managers of a process
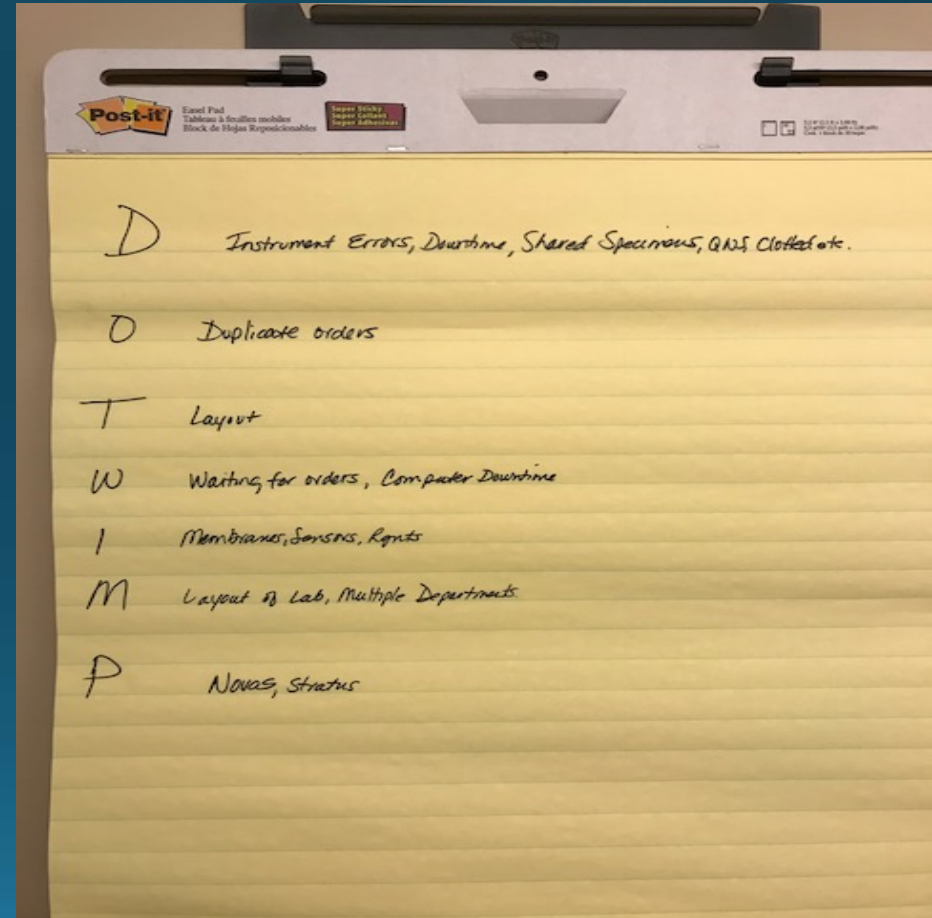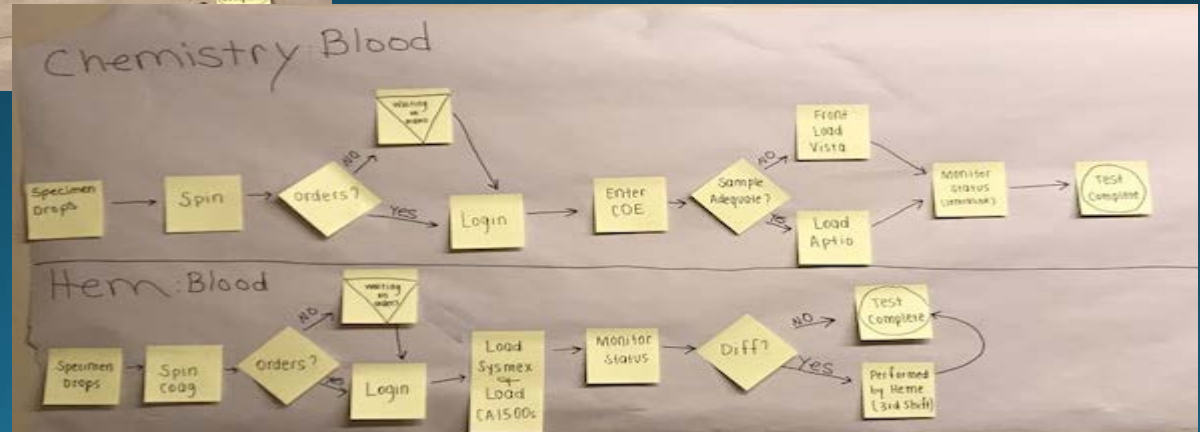
- Murphy's Analysis
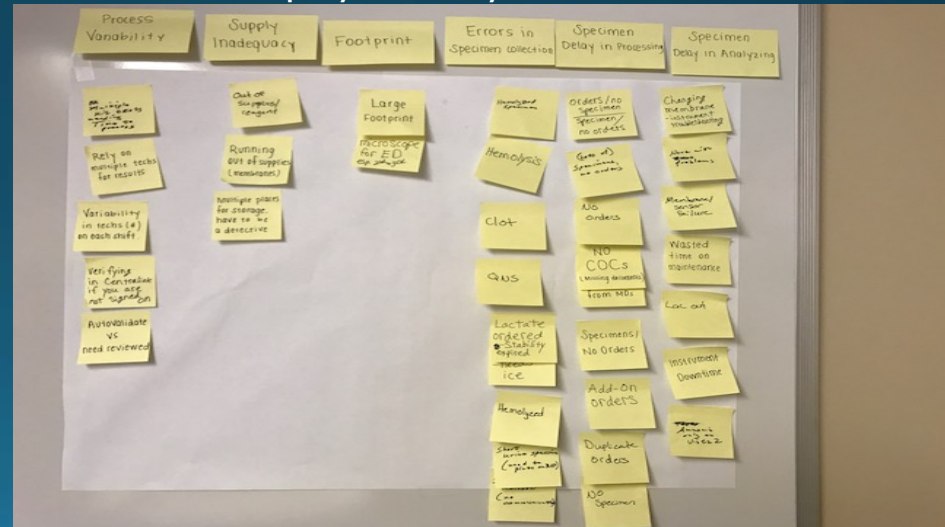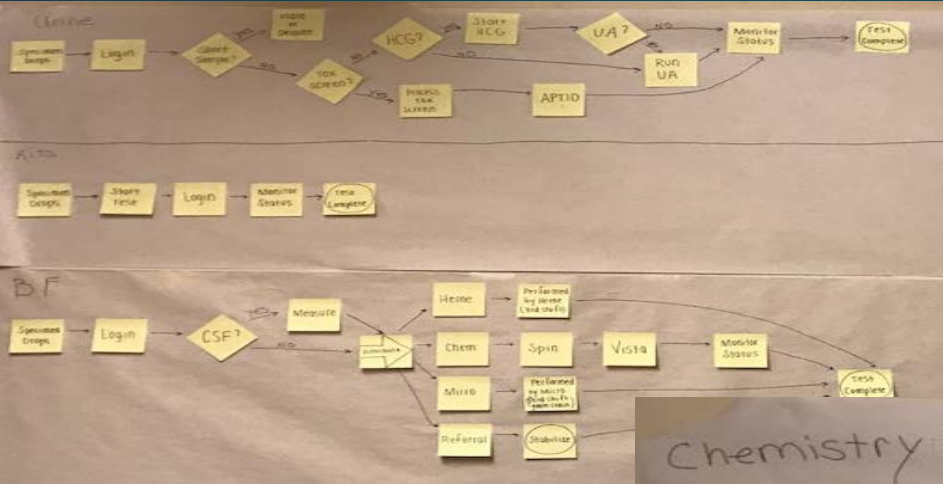
Current Process + Murphy's Analysis
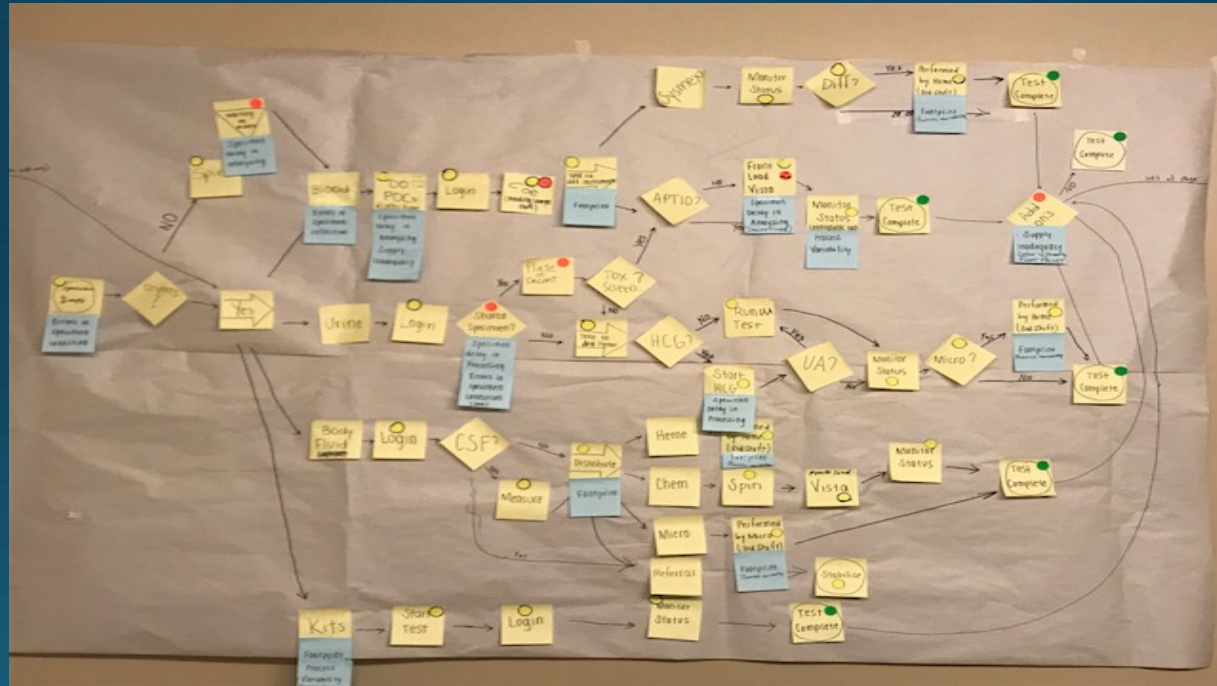
DOTWIMP Waste

- **Defects-** errors, not meeting quality standard

- **Overproduction –** more than is needed, duplicates

- **Transportation –** of entities, primary or secondary

- **Waiting-** for something needed to move forward in process

- **Inventory-** extra raw materials, excessive work in progress

- **Motion –** extra physical movement in place or place to place

- **Processing-** includes non-value added steps

D	Instrument Errors, Downtime, Shared Specimens, QNS Clotted etc.
O	Duplicate orders
T	Layout
W	Waiting for orders, Computer Downtime
I	Membranes, Sensors, Rgnts
M	Layout of Lab, Multiple Departments
P	Novas, Stratus

Future process map

- Improved on the process

- Obtained buy-in from all lab/ED stakeholders

Standard Work Instructions

Standard Work Instruction Body Fluids
Standard Work Instruction Chemistry
Standard Work Instruction Hem
Standard Work Instruction Kit Tests
Standard Work Instruction Urine

Bench Modifications

- Remove POC instruments
- Small centrifuges moving to bench
- Remove drawers on the right side next to tube station
- Add scope back for third shift
- One small refrigerator going to counter under Alere
- One small refrigerator for extra grey plasma
- Kit testing moved to cart

Control Plan Summary

Columbus Regional Hospital
Department Name/Process
Control Plan Summary

Purpose	Owner/Decision Maker	Control Tool	Measure/Monitor (What will be measured)	Frequency (How often and at what point)	How will it be measured (Include sample size etc)	Goal/Action Trigger	Response to Action Triggers (who will respond & how)
Cardiac Testing: Ensure results are verified in a timely manner	Tan Springhorn	Fusion Charts	The average time from receipt of specimen to time of verification Outliers above set threshold	Daily monitoring for first month. Once numbers stabilize, weekly.	All specimens tested will be included on the Fusion Chart	TAT <30 min Outliers < 10% per day	Owner: reviews daily TAT performance report, follow up with MT, coaching/mentoring if needed.
BMP: Ensure results are verified in a timely manner	Tan Springhorn	Fusion Charts	The average time from receipt of specimen to time of verification Outliers above set threshold	Daily monitoring for first month. Once numbers stabilize, weekly.	All specimens tested will be included on the Fusion Chart	TAT <30 min Outliers < 10% per day	Owner: reviews daily TAT performance report, follow up with MT, coaching/mentoring if needed.
Lactic Acid: Ensure results are verified in a timely manner	Tan Springhorn	Fusion Charts	The average time from receipt of specimen to time of verification Outliers above set threshold	Daily monitoring for first month. Once numbers stabilize, weekly.	All specimens tested will be included on the Fusion Chart	TAT <30 min Outliers < 10% per day	Owner: reviews daily TAT performance report, follow up with MT, coaching/mentoring if needed.

Champion: Matt Chaille   Process Owner: Jonathan Tan, Kathy Springhorn

Transition Complete

On December 20th, 2017 at 9:00 am, the laboratory discontinued testing chemistry samples on the point of care instruments. Cardiac panel, Chem 8 and lactic acid previously run on the stratus and Nova (POC) are now performed on the Siemens Vista analyzers. This allowed the laboratory to streamline our testing process while utilizing the newest technology available.

COLUMBUS REGIONAL HOSPITAL

INTERNAL CORRESPONDENCE

TO: ED physicians and staff

FROM: Darcy Hill, Manager of Laboratory Testing Services
Dr. MaryAnn Bridge, Medical Director

DATE: December 13, 2017

SUBJECT: Discontinuation of POC testing

Beginning December 20th, 2017 at 9:00 am, the laboratory will discontinue testing chemistry samples on the point of care instruments. All testing will be performed on the Siemens Vista analyzers. This will include the cardiac panel, chem 8 and lactic acid tests. This will allow the laboratory to streamline our testing process while utilizing the newest technology available.

All ED power plans will be updated to include the correct replacement orders. After the change when a saved favorite power plan containing this order is used, you may receive an alert reminding you to resave as a new favorite. See the conversion table below.

Remove from PP	Replacement order
POC BNP (NTpro) Request	NTproBNP
ED POC BNP (NTpro)	NTproBNP
POC Cardiac Series Request	Cardiac Series #1
ED POC Cardiac Series	Cardiac Series #1
POC Chem 8 Request	Basic Metabolic Panel
ED POC Chem 8	Basic Metabolic Panel
POC Creatinine Request	Creatinine
ED POC Creat.	Creatinine
POC Critical Care Panel Request	Basic Metabolic Panel, Lactic Acid, Hemoglobin and Hematocrit
ED POC CritCare Panel	Basic Metabolic Panel, Lactic Acid, Hemoglobin and Hematocrit
POC Hgb and Hct Request	Hemoglobin and Hematocrit
ED POC HgbHct	Hemoglobin and Hematocrit
POC Lactate Request	Lactic Acid
ED POC Lactate	Lactic Acid
POC Lytes Request	Electrolyte Panel
ED POC Lytes	Electrolyte Panel
POC Sepsis Request	Basic Metabolic Panel, Lactic Acid
ED POC Sepsis Panel	Basic Metabolic Panel, Lactic Acid

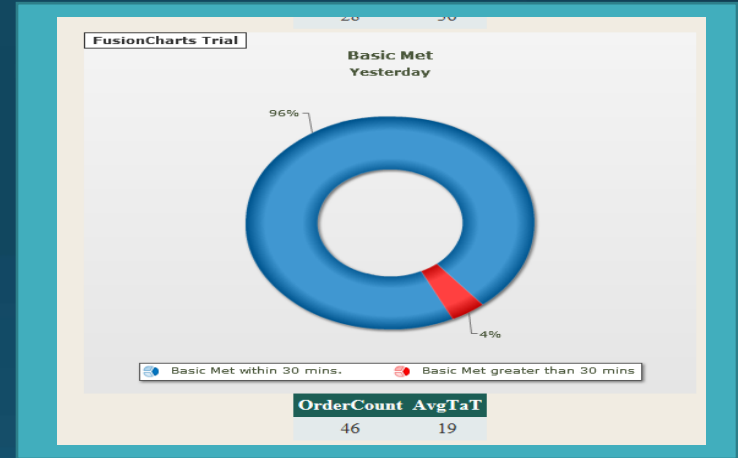Please contact Darcy Hill, laboratory manager with any questions at 812-376-5170.

Emergency Department Bench Workflow Improvement Project

Tools used to monitor and achieve our goal:

ED Test Reporting Consistency

Controls: What will be monitored?

- TAT for Troponin, BMP, Lactic Acid
- Outlier for specimens that are not
- completed within 30 minutes
- Investigation and follow up
- Tool to evaluate the new process
- Monitored daily at first

FusionCharts Trial

Basic Met Yesterday

96%

4%

Basic Met within 30 mins.   Basic Met greater than 30 mins

OrderCount	AvgTaT
46	19

000002017338001831	5551388970	12/4/2017 3:55:30 PM	Basic Met-	AGAP.	ST - Stat	Weesner MD, Carol	12/4/2017 4:26:00 PM	12/4/2017 4:33:16 PM	12/4/2017 6:11:53 PM	98
000002017338001831	5551388970	12/4/2017 3:55:30 PM	Basic Met-	BUN.	ST - Stat	Weesner MD, Carol	12/4/2017 4:26:00 PM	12/4/2017 4:33:16 PM	12/4/2017 6:11:53 PM	98
000002017338001831	5551388970	12/4/2017 3:55:30 PM	Basic Met-	BUN/Creatinine.	ST - Stat	Weesner MD, Carol	12/4/2017 4:26:00 PM	12/4/2017 4:33:16 PM	12/4/2017 6:11:53 PM	98
000002017338001831	5551388970	12/4/2017 3:55:30 PM	Basic Met-	CO2.	ST - Stat	Weesner MD, Carol	12/4/2017 4:26:00 PM	12/4/2017 4:33:16 PM	12/4/2017 6:11:53 PM	98
000002017338001831	5551388970	12/4/2017 3:55:30 PM	Basic Met-	Calcium Level.	ST - Stat	Weesner MD, Carol	12/4/2017 4:26:00 PM	12/4/2017 4:33:16 PM	12/4/2017 6:11:53 PM	98
000002017338001831	5551388970	12/4/2017 3:55:30 PM	Basic Met-	Chloride Level.	ST - Stat	Weesner MD, Carol	12/4/2017 4:26:00 PM	12/4/2017 4:33:16 PM	12/4/2017 6:11:53 PM	98
000002017338001831	5551388970	12/4/2017 3:55:30 PM	Basic Met-	Creatinine level	ST - Stat	Weesner MD, Carol	12/4/2017 4:26:00 PM	12/4/2017 4:33:16 PM	12/4/2017 6:11:53 PM	98
000002017338001831	5551388970	12/4/2017 3:55:30 PM	Basic Met-	Glucose Random.	ST - Stat	Weesner MD, Carol	12/4/2017 4:26:00 PM	12/4/2017 4:33:16 PM	12/4/2017 6:11:53 PM	98
000002017338001831	5551388970	12/4/2017 3:55:30 PM	Basic Met-	Hrs PP.	ST - Stat	Weesner MD, Carol	12/4/2017 4:26:00 PM	12/4/2017 4:33:16 PM	12/4/2017 6:11:53 PM	98
000002017338001831	5551388970	12/4/2017 3:55:30 PM	Basic Met-	Potassium Level.	ST - Stat	Weesner MD, Carol	12/4/2017 4:26:00 PM	12/4/2017 4:33:16 PM	12/4/2017 6:11:53 PM	98
000002017338001831	5551388970	12/4/2017 3:55:30 PM	Basic Met-	Sodium Level.	ST - Stat	Weesner MD, Carol	12/4/2017 4:26:00 PM	12/4/2017 4:33:16 PM	12/4/2017 6:11:53 PM	98

Monitoring Dashboard

Centralink Data Manager

- Auto-verification rules and calculations are currently all built in CentraLink Data Management system vs LIS

   Auto-verification rate improvement from 73 % to 90 %

- Continuous improvement process in place for TAT. Create new rules in CentraLink or update rules to help with tube and sample management
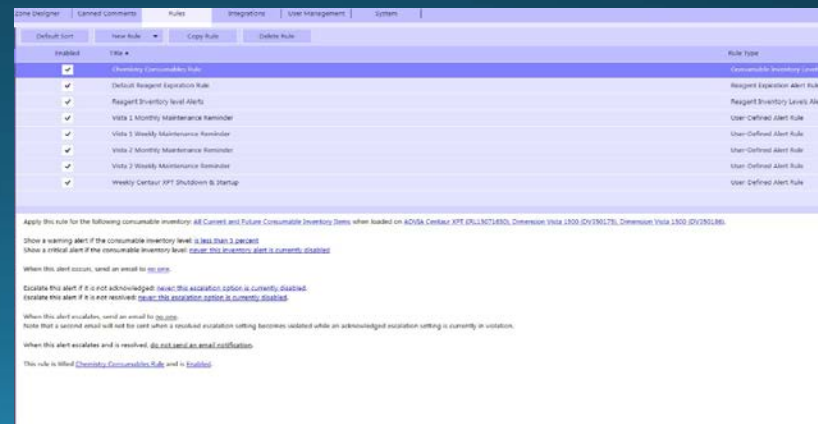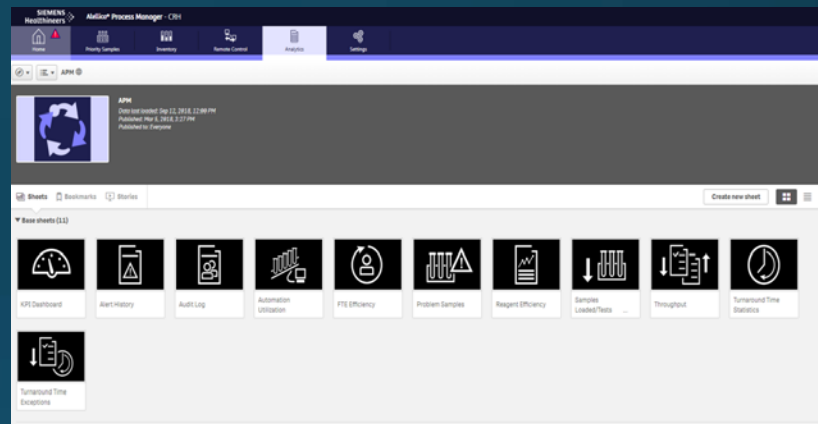
Atellica Process Manager (APM)2.0

Implemented APM 2.0 March 2018 as the laboratory workflow and efficiency tool

Current Use of APM 2.0

- Monitor STAT samples to improve TAT
  - Priority Alert rules, real time reporting analytics
- Instrument issue alerts
- Maintenance & reagent inventory alerts
- Remote Instrument Access
  - Communicate current testing times
  - Transmit test results
- Analytic Reports

Atellica Process Manager 2.0

Priority Sample Rules setup monitor and improve TAT

APM 2.0 TAT Report
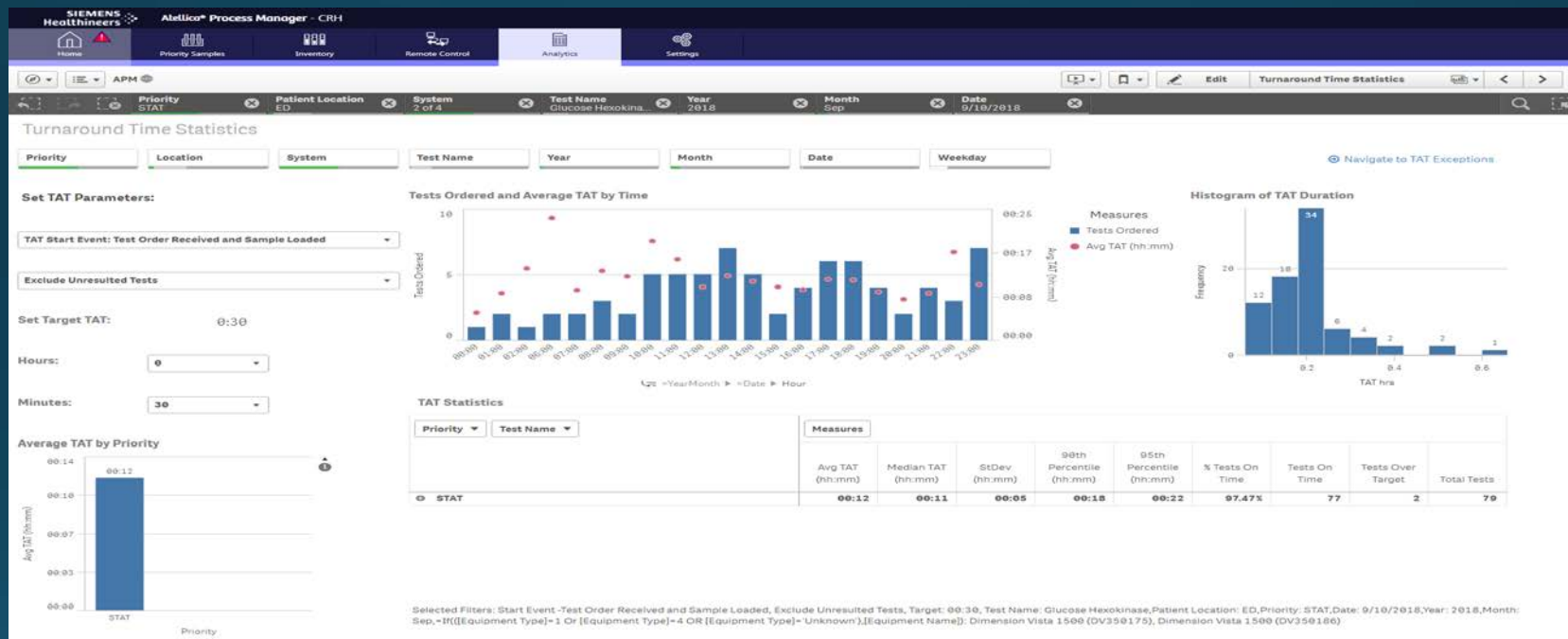
APM 2.0 TAT report used to monitor real time turn around times; report quarterly to ED colleagues

APM 2.0 TAT Exceptions Report
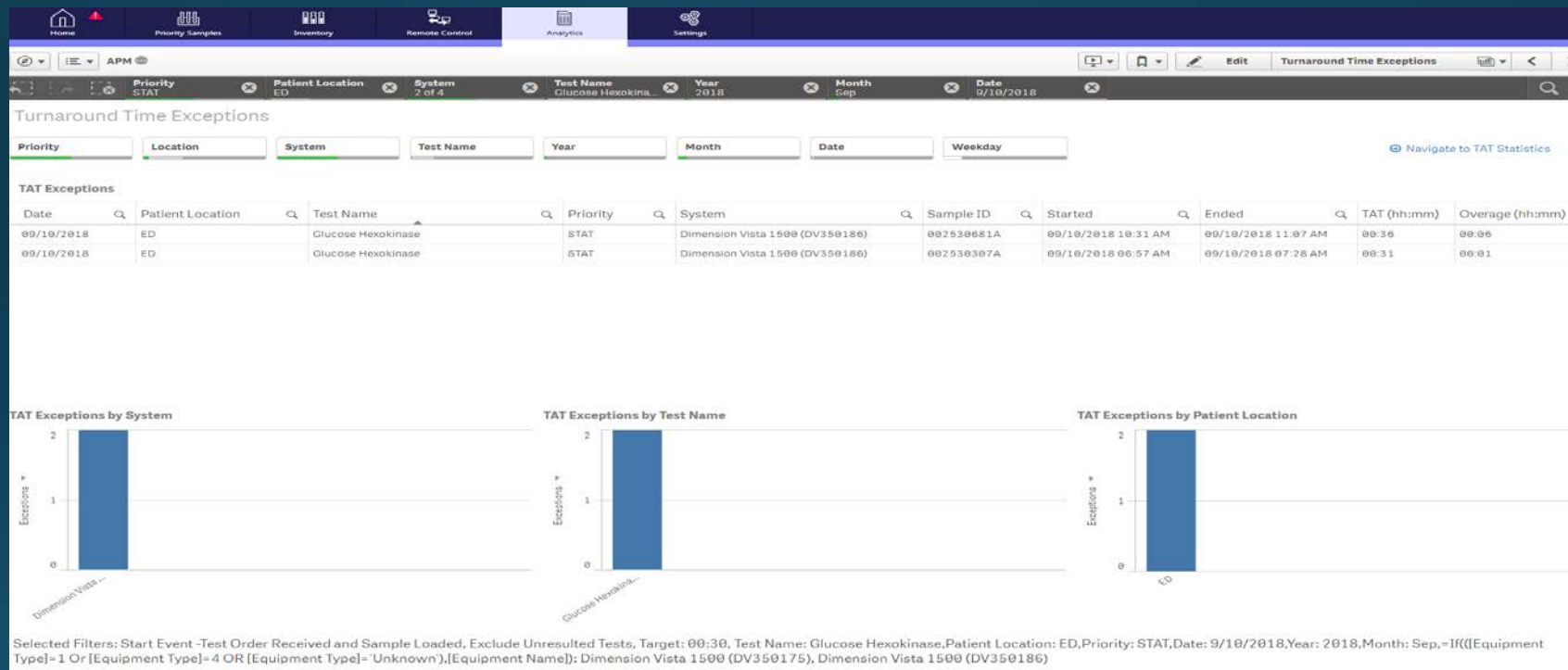
APM 2.0 TAT Exceptions report used to monitor real time turn around time exceptions; report quarterly to ED colleagues

APM 2.0 Analytic Reports

Investigate problem samples pre-analytic, analytical and post-analytic phases of testing.

ED Collaboration

- Identifying their champion and discuss the change.
- Attending ED section meeting. To answer any questions/clarifications they will have.
- Showing them data on how the change will affect them.
- Continuous communication even after the change has been implemented.

Study: TAT Comparisons

TAT for BMP, Troponin and Lactate for POC and Vistas

Test Name	Average TAT*
POC Chem 8	10
Vista BMP	18
POC Troponin	20
Vista Troponin	18
POC Lactic Acid	9
Vista Lactic Acid	20

* Time for Vista TAT includes the 3 spin time

Metrics

POC Analyzer Cost/Test	Vista Analyzer Cost/Test	Cost Difference		Monthly POC Test Volume	Potential Monthly Savings
$ 5.83	$ 0.21	$ 5.62	BMP	154	$ 866
$ 12.69	$ 2.27	$ 10.42	Troponin	837	$ 8,724
$ 5.83	$ 0.29	$ 5.54	Lactic Acid	407	$ 2,254
				Total	11,844
				Annual testing savings	$ 142,128
			Telcor annual POC contract		$ 7,274
			TOTAL ANNUAL		**$ 149,402**

ED TAT Statistics

Month	Percentage
February	46%
March	65%
April	83%
May	100%
June	83%
July	84%
August	90%

Hi Guys.

Great Job! ☺

I did noticed that there were some samples that got delayed because it had an error "Unknown Tube type" on the line. It took some time before it was reintroduced back. I am working with Siemens to replace the whole cover for the camera to fix this issue.

In the meantime, we can catch this error by using the APM. The error will show up in your priority sample tab in red with the Unknown tube type error. I know it is hard to always look at the samples in the priority output rack.

We are still within our goal, but I usually check what the outliers is to investigate and try to find a solution for it.

Thank you guys!

Jonathan

From: 09/29/2018   To: 09/29/2018   [Run]

FusionCharts Trial
ED Troponin and Cardiac
Yesterday

91

4%

● ED Troponin and Cardiac within 30 mins.
● ED Troponin and Cardiac greater than 30 mins

OrderCount	AvgTaT
43	24

FusionCharts Trial
UA w/Reflex
Yesterday

100%

0%

● UA w/Reflex within 30 mins.   ● UA w/Reflex greater than 30 mins.

OrderCount	AvgTaT
27	10

FusionCharts Trial
Basic Met
Yesterday

FusionCharts Trial
ED Lactic Acid
Yesterday

	Measure	Owner	Threshold	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
																	Day of Month SEPTEMBER 2018																
Troponin-I	n	Jonathan		43	34	44	43	52	70	58	27	40	57	43	49	44	44	39	43	41	41	42	41	49	22	51	57	53	53	39	44	43	26
	In-Lab Avg TAT	Jonathan	≤30 min	19	19	20	19	21	20	19	19	20	19	20	20	22	19	22	22	20	21	20	20	20	18	20	20	19	22	21	19	24	19
	% Outliers > 30 min	Jonathan	≤10 %	0	2	2	2	5	1	1	0	5	1	6	2	3	2	5	7	7	0	0	0	0	0	4	1	1	8	5	0	7	0
Lactic Acid	n	Jonathan		11	17	13	14	21	18	21	4	13	19	16	20	13	18	19	14	13	13	19	15	18	16	18	20	16	13	24	14	11	9
	In-Lab Avg TAT	Jonathan	≤30 min	17	20	17	18	19	18	20	18	18	19	18	19	22	20	20	21	18	19	18	19	20	18	20	21	21	22	20	19	19	19
	% Outliers > 30 min	Jonathan	≤10%	0	5	0	0	4	0	4	0	0	5	0	0	15	0	0	7	0	0	15	0	0	6	11	10	6	7	8	7	0	0
BMP	n	Jonathan		41	58	57	61	65	66	64	41	54	76	69	56	54	57	51	55	59	60	71	65	54	46	60	74	56	58	65	53	48	52
	In-Lab Avg TAT	Jonathan	≤30 min	18	17	17	18	19	18	17	17	19	17	17	17	19	19	18	18	17	17	19	17	18	19	18	18	18	20	20	17	19	18
	% Outliers >30 min	Jonathan	≤10%	2	0	1	3	3	1	3	2	5	5	2	0	4	4	0	1	3	3	0	0	2	2	3	2	3	5	7	0	4	1

90% for the month of September!
We made our goal for this month! Great Job everybody! ☺

Successes!

- Improved consistency
- SWI for techs to look up their questions and know how to run the bench
- We are better-able to answer questions from the ED regarding the status of their results. The tools we have in the APM and CentraLink allow us to stay at the bench to answer questions which improves our speed (before we had to physically go to the instruments).
- Post Green Belt, I feel there is a greater awareness between departments on TATs which leads to a more consistent reporting of results. This is a team effort to be good.

Room for Improvement

- Better buy-in from techs regarding using the automation line for their ED samples. We should have emphasize it more or do some sort of activity to promote it better.

- By focusing on TAT, the ED person may sacrifice the use of the automated system for a quicker TAT by front loading specimens on the chemistry analyzers. By not utilizing tools available to us, we fall back on an individual effort to appear good rather than the team effort to consistently be good.

ED Feedback

- It was a rough start. There was a lot of doubt whether we were really achieving our goal.

- Push back on our Stats and numbers.

- Key is always open constant communication and follow-up .

- Currently ED physician group has no problem with the new process.

Preparing your lab for today and tomorrow

Consolidation

Standardization

Value-based care
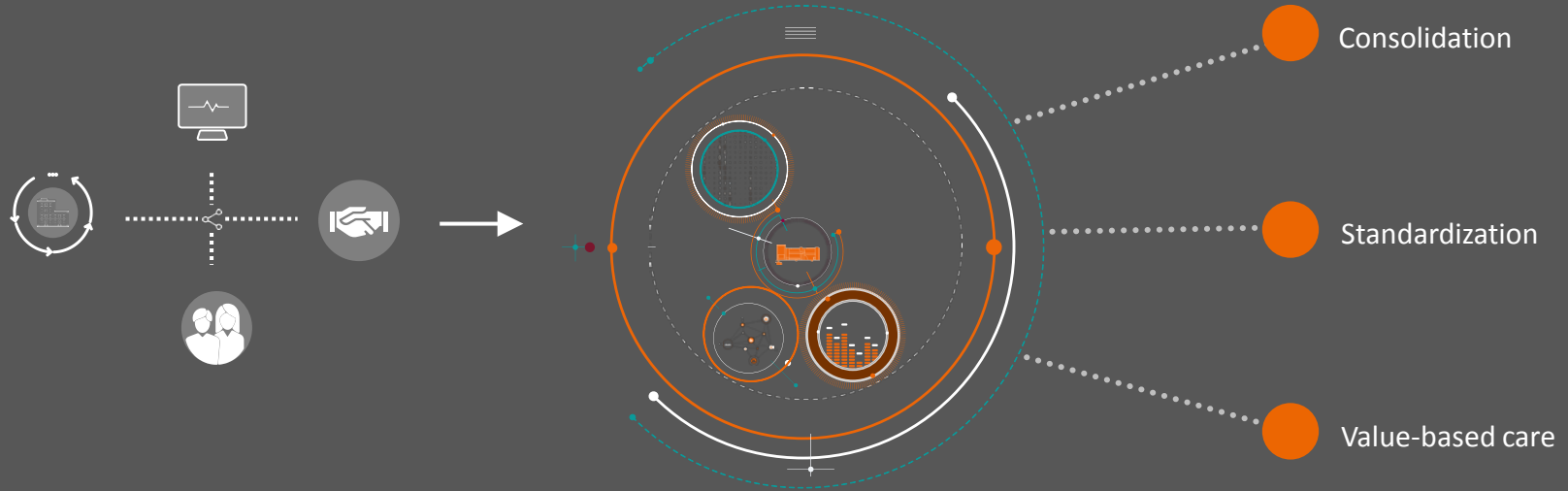
Pioneering the digital trans-formation of clinical laboratories

Turning data into insight, process into performance, and experience into expertise

Preparing your lab for today and tomorrow