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Waste Reduction in an Interdependent System through Standardization and Lean Thinking: A Six Platforms

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Waste Reduction in an Interdependent System Through Standardization and Lean Thinking: All Six Platforms

Automated Chemistry

Chiemi Tabata

Vincent Dizon

SELP 695, Capstone Project

Spring 2014

Dr. Bo W Oppenheim

Why Lean In the Laboratory?

- What can a healthcare system learn from an automaker?
- Healthcare cost is increasing and reimbursement rates are going down. Operational cost are up. Hard to maintain profit margin.
- Improve clinical outcomes-improve patient experience.
- The main objective of Lean, when applied in the laboratory, is to deliver quality patient laboratory results, at lowest cost, within the shortest time frame
- Build upon what we already know.

Regional Reference Laboratory- Automated Chemistry

Customer	Value
Patient/MD KP Enterprise	Shorter throughput time and High Test Quality Greater productivity and competitiveness

Value Compass



KPSC's Medicare Plan has again been ranked No. 1 in the nation by the [National Committee for Quality Assurance](#) (NCQA) for consumer satisfaction, prevention services, and clinical treatment outcomes.

HEDIS & Performance Measurement

- The Healthcare Effectiveness Data and Information Set (HEDIS) is a tool used to measure performance on important dimensions of care and service.
- HEDIS makes it possible to compare the performance of health plans on an "apples-to-apples" basis.
- HEDIS scores look at whether patients are receiving regular screening.
- **Cholesterol** Management for Patients With Cardiovascular Conditions – **LDL -C**
- Comprehensive Diabetes Care – **A1c and LDL-C**

Departmental Statistics:

- >18 M tests performed Annually
- Operations (3 shifts): 24/5 + 16/2
 - * AM: 7 am to 3:30 pm
 - * PM: 3 pm to 11:30pm
 - * GY : 11 pm to 7:30 am
- Staff: 20 licensed, 21 support staff, 3 Section Managers, Department Head, Operations Director

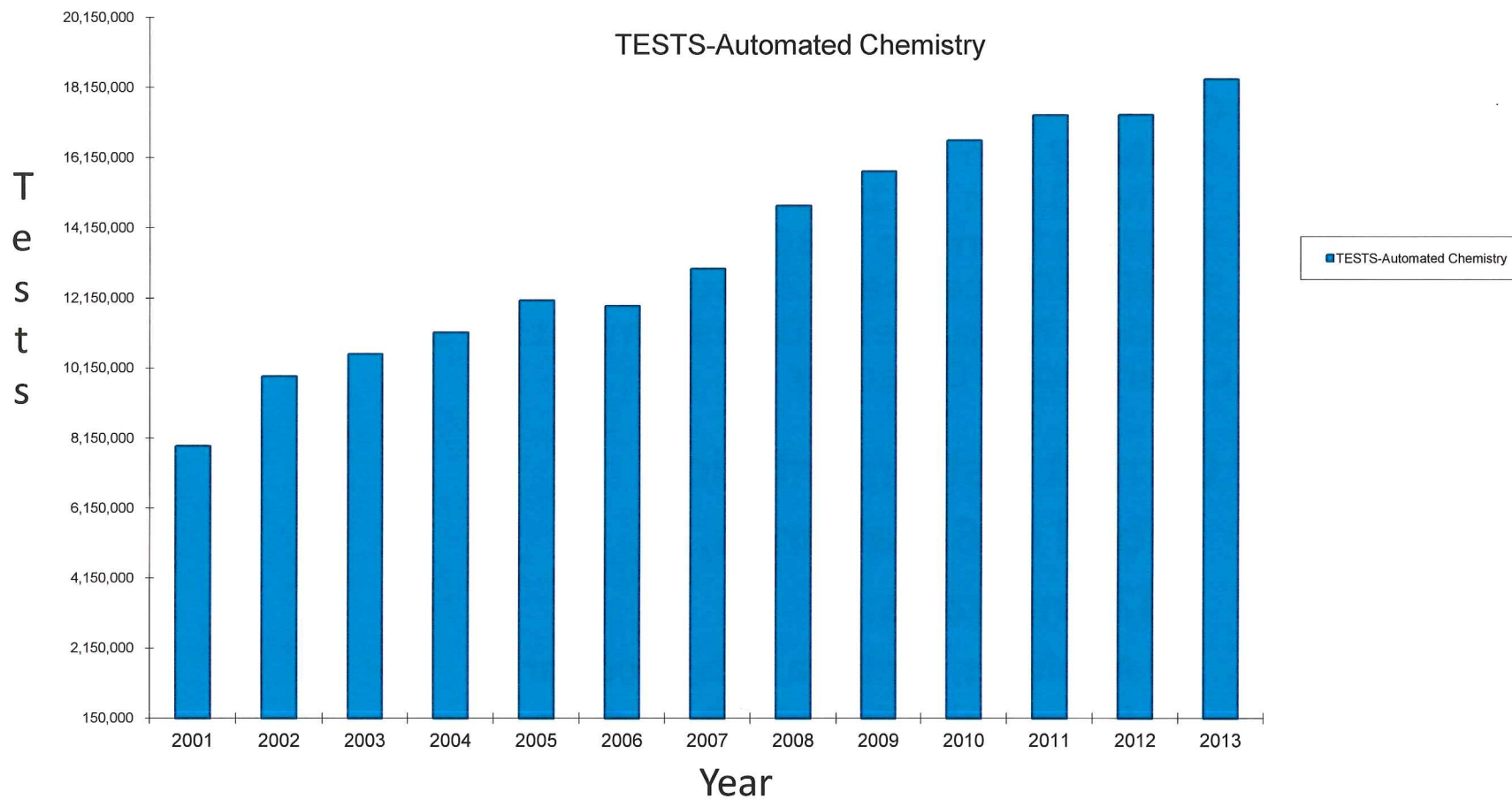
➤ Current Instrumentation

Total of 6 platforms,

32 analyzers:

6 Architects, 3 Integra 800s, Modular P (5 devices), 2 Centaur XP, Modular E170 (6 devices), 2 Beckman

Olympus 5400s (3 devices each with 2 ISE modules)



Project Focus

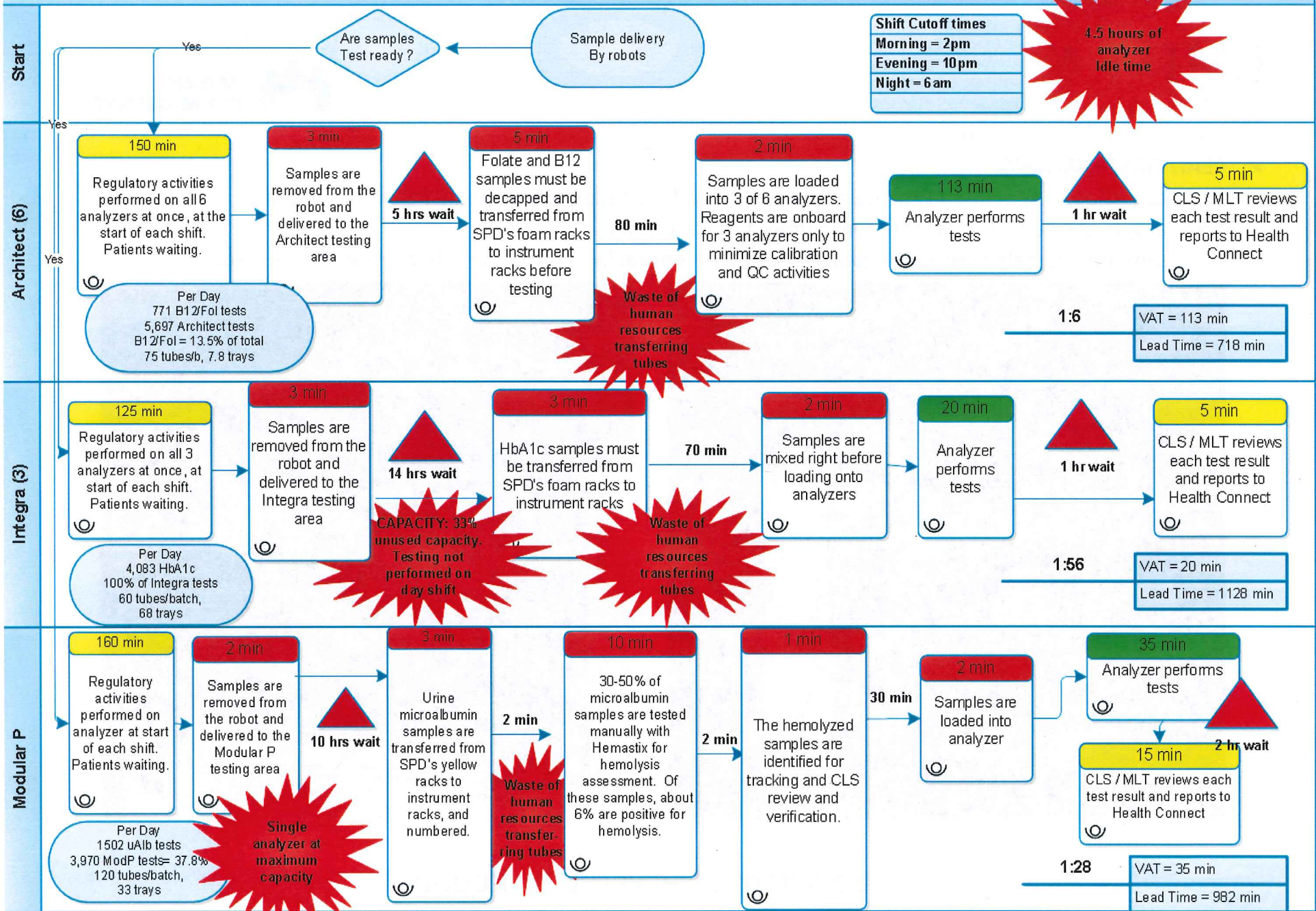
- To identify and reduce Waste
- Provide Best Quality
- Streamline Operations / Eliminate Variability
- Promote Value - Patient Care / Service
- Improve work environment – Improve employee morale

Kaiser Regional Reference Laboratories
North Hollywood, CA
Automated Chemistry Workflow Analysis

Lean Thinking Maps

- Current State: Waste Walk
- Future State: Recommendations for immediate improvement
- Ideal State: Eliminating as much waste as possible. Outside of LEAN.

Current State Map

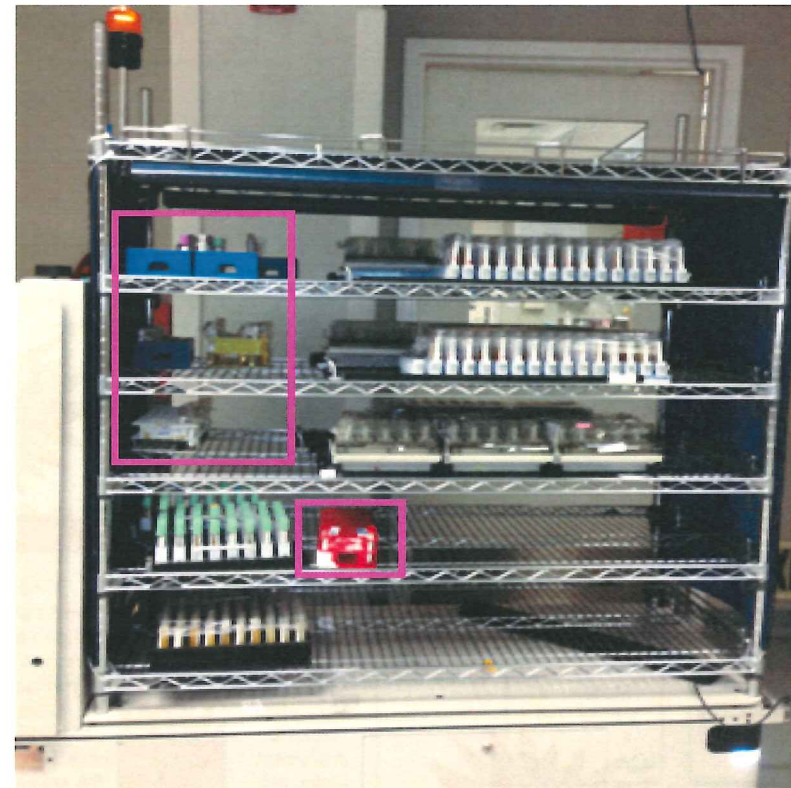


➤ **LEAN OBSERVATIONS:**

The automation in Specimen Processing sorts and loads samples to test ready instrument racks.

Most sample are delivered after the instrument racks are full.

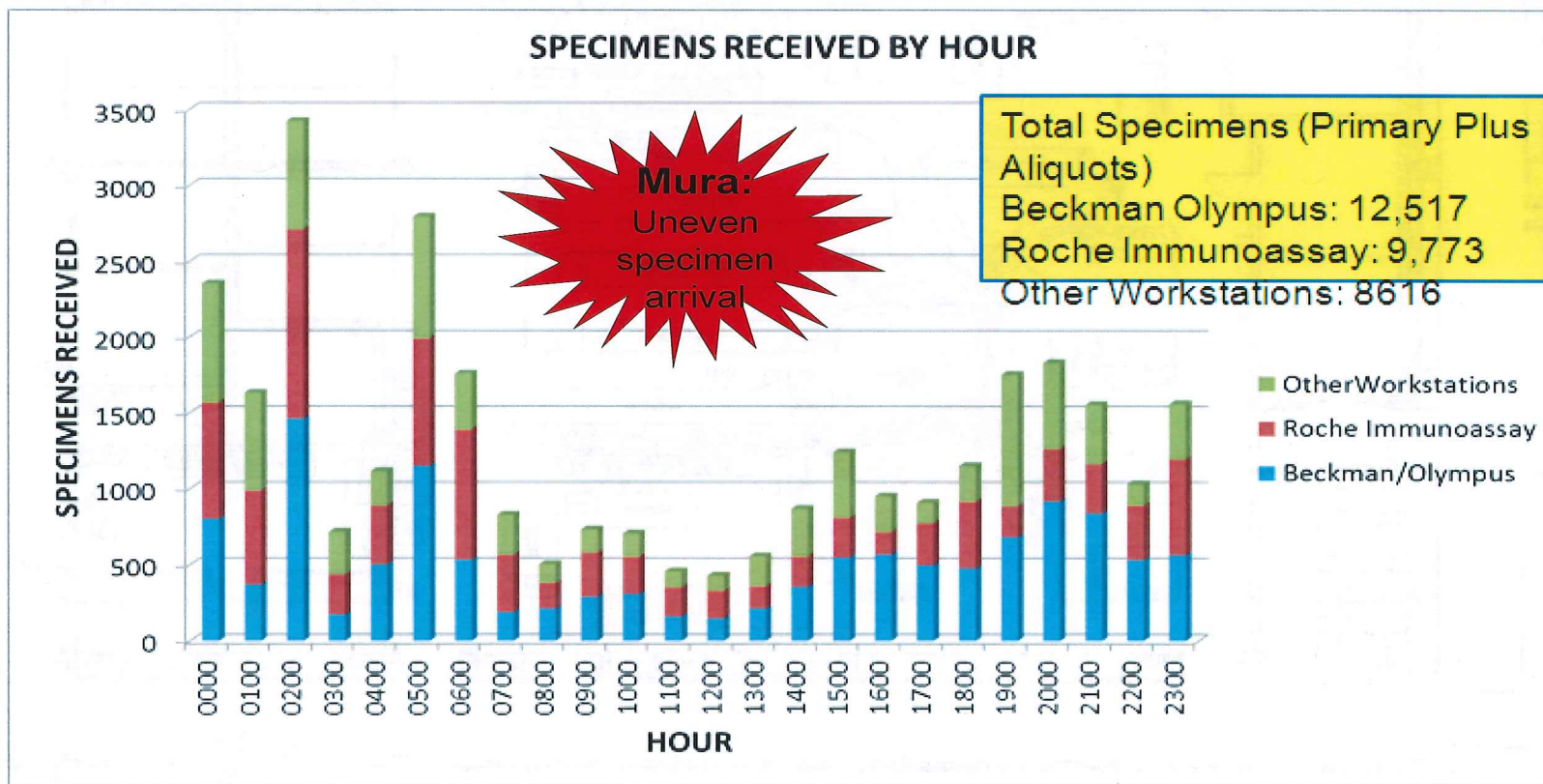
When samples are delivered in irregular, non-instrument racks, manual sample transfer is required.



Specimens Delivered by Robots

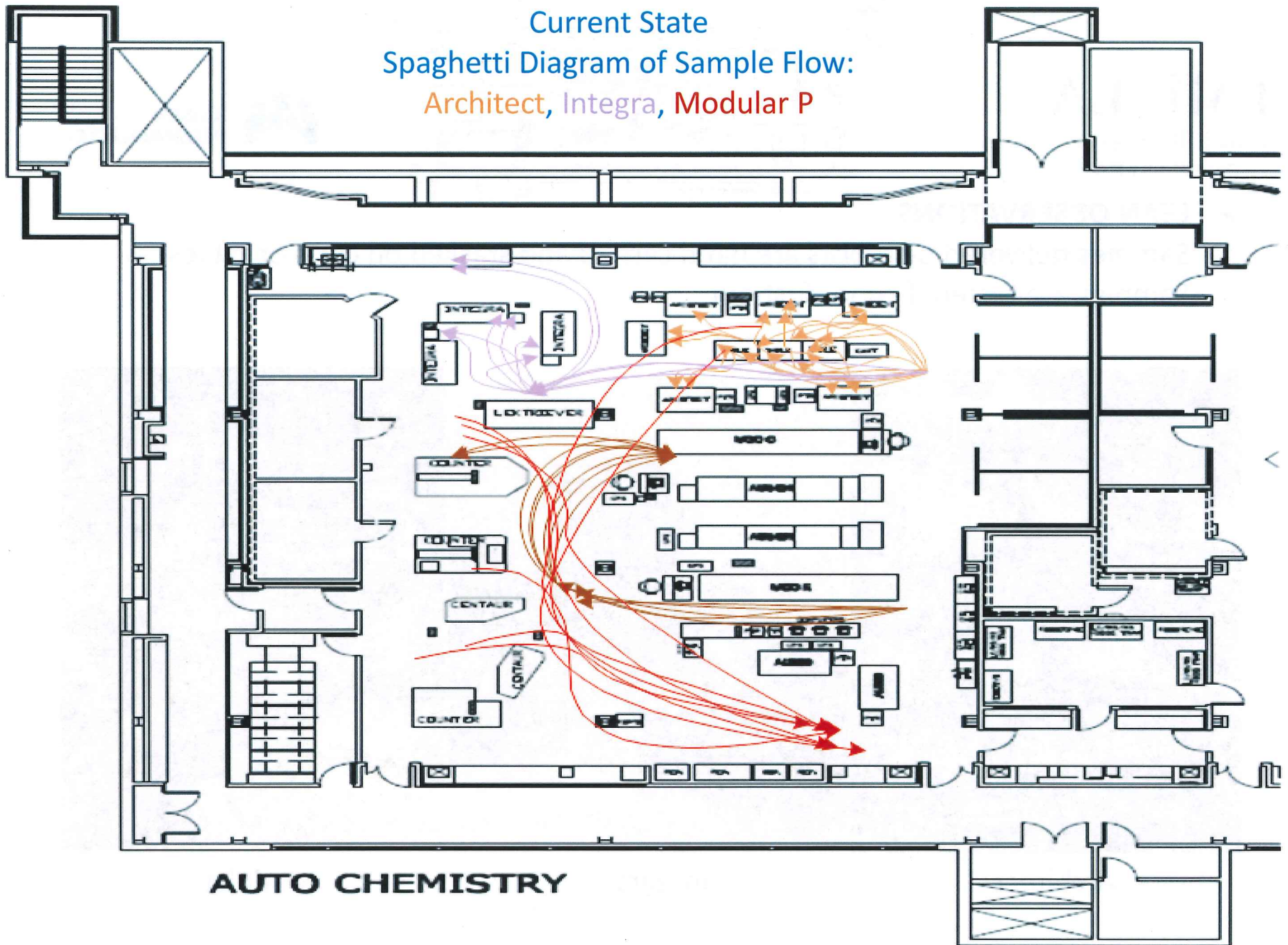
LEAN OBSERVATION:

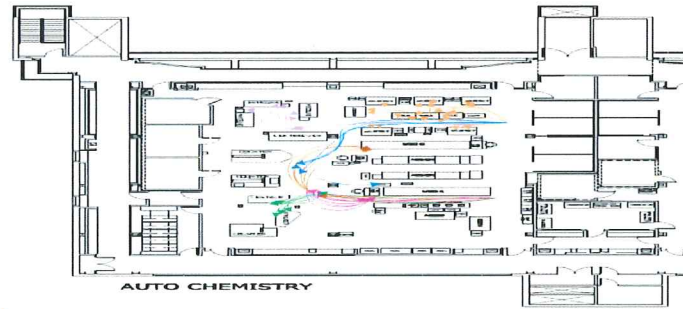
Samples arrival times to Automated Chemistry reflect courier deliveries from medical centers and MOBs.



Specimen Arrival Pattern in Automated Chemistry

Current State
Spaghetti Diagram of Sample Flow:
Architect, Integra, Modular P





➤ **LEAN OBSERVATIONS:**

Samples delivered by robots are hand carried and stacked on carts or tables.
Samples are tested, first in, first out.



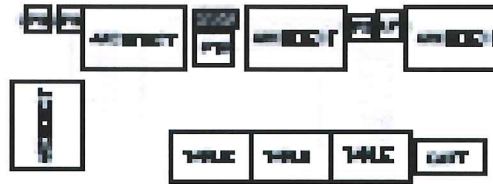
Architect



Integra



Modular P



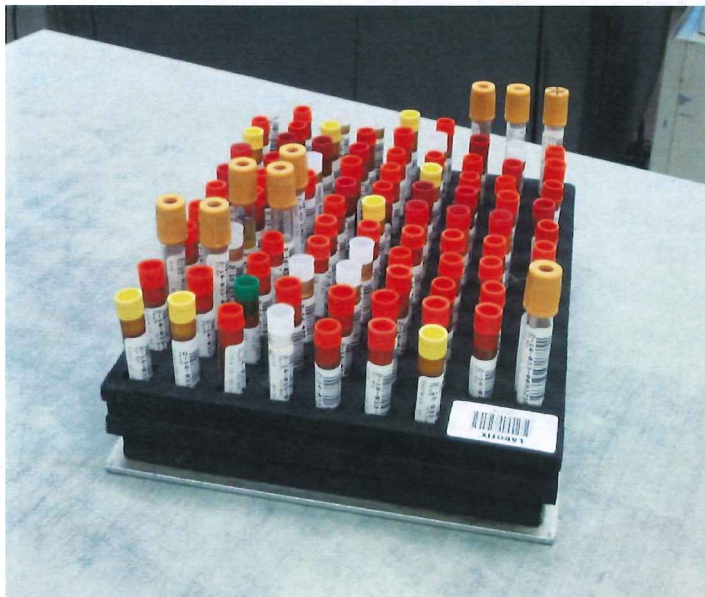
Architects: Vitamin B12 & Folate

Architect maintenance and calibration performed concurrently, creating down time
Samples waiting to be tested.

Waste of human potential, manually uncapping samples. Risk employee injury.

Excessive rework transferring tubes between different containers.

B12 and Folate reagents onboard only 3 of 6 Architect analyzers, delaying testing.





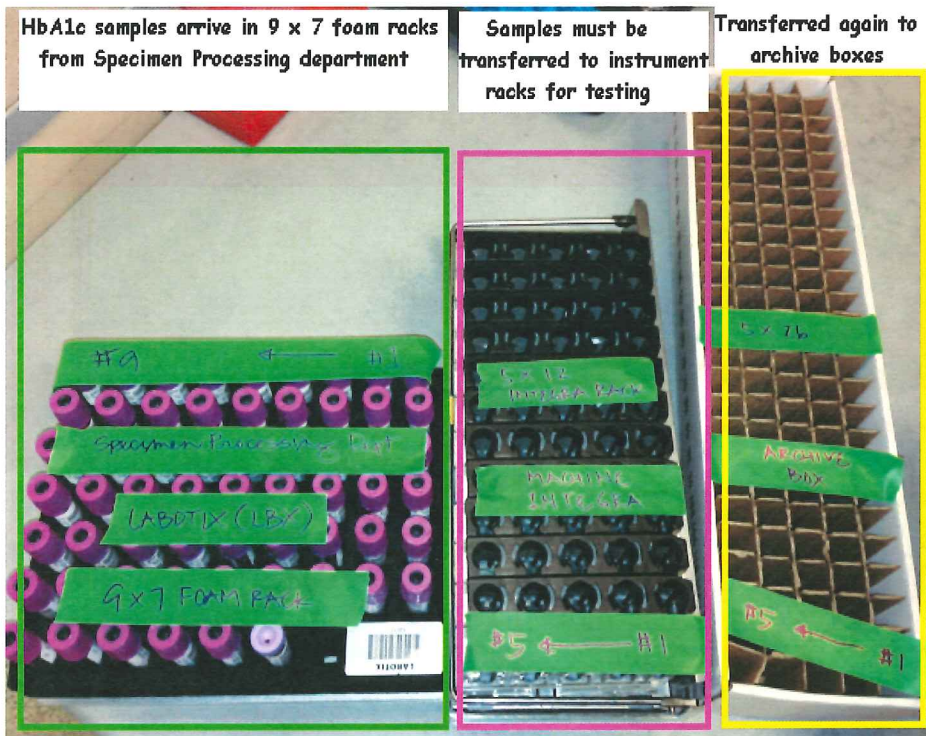
Integra: HbA1c

➤ **LEAN OBSERVATIONS:**

Integra maintenance and calibration performed concurrently, creating down time. Samples waiting to be tested.

Waste of human potential, transferring tubes between different containers.

Two of the three analyzers are more than 7 years old. Experience many hardware problems.



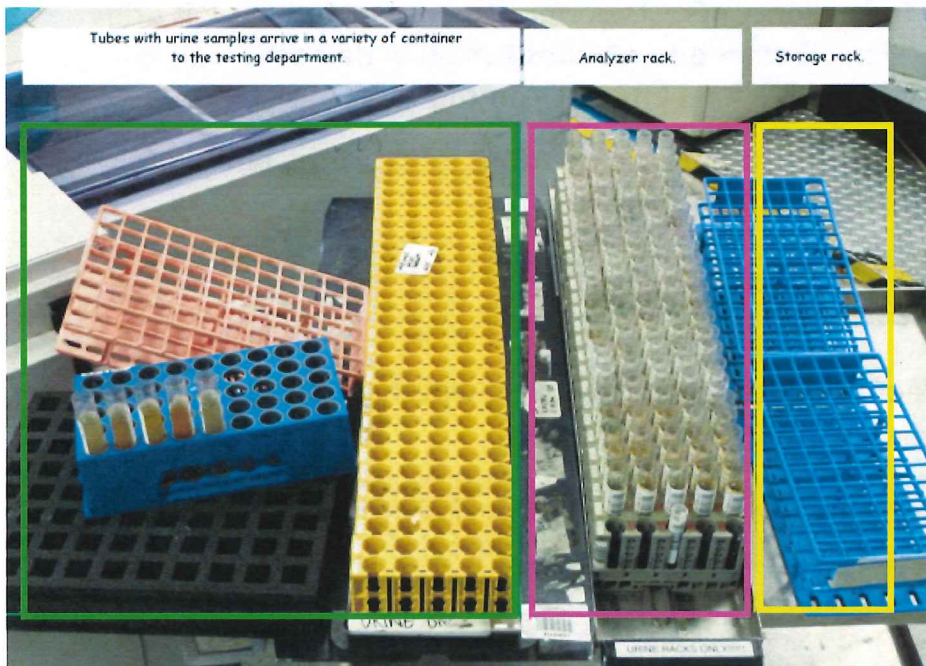


Modular P: Urine Microalbumin

Modular P is a single analyzer being utilized at maximum capacity. Any regulatory and maintenance activities will require instrument downtime.

Waste of human potential, rework, transferring tubes between different containers.

Manual Hemastix dipstick test being performed on urine Microalbumin samples.



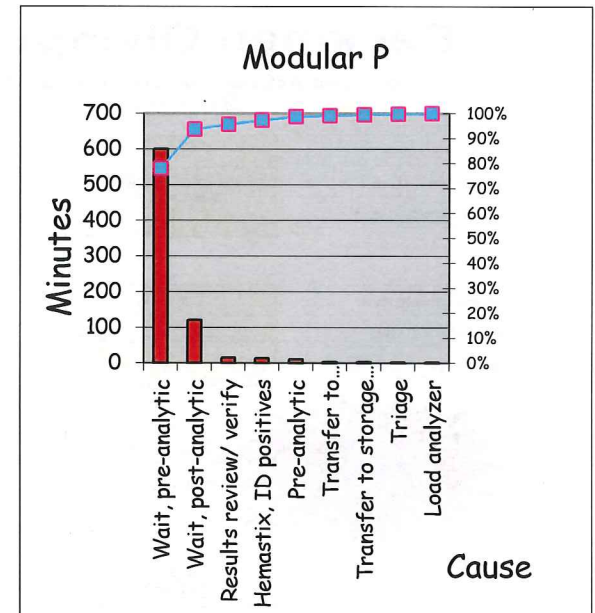
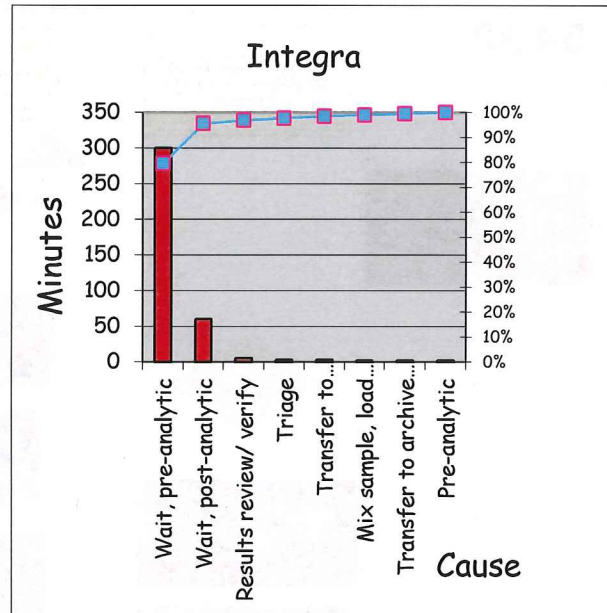
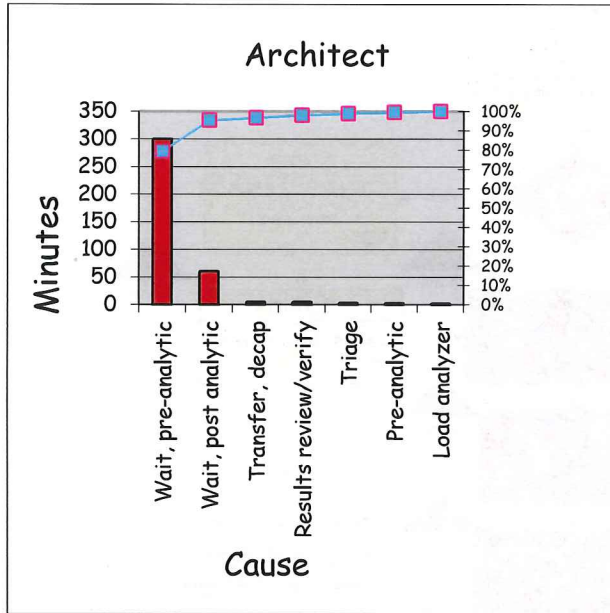
Root Cause Analysis

Gemba Interviews - Question: Which testing area is most frustrating?

Answer: Modular P.

Question	Root Cause
Why is the Modular P testing area frustrating?	<ul style="list-style-type: none"> ➤ Test review/release is very manual and takes a long time. (Software limitations that cannot be fixed in the near future) ➤ Samples must be manually transferred between multiple container types. (External – Collaborate with SPD to eliminate this waste) ➤ The majority of tests performed on the Modular P is urine Microalbumin that requires a manual Hemastix testing process. (Within internal control)
Why is Hemastix testing being performed?	Manufacturer claims that hemolysis interferes with Microalbumin testing.
Why is the workflow for Hemastix testing different between operators and shifts?	Lack of knowledge, training and standardization of the Hemastix test.
Why are urine samples that does not appear to be hemolyzed positive for Hemastix?	Lack of in-house study to inform whether the Hemastix test is needed.
Why is Hemastix testing being performed, even when grossly hemolyzed urine samples do not reach the level of hemoglobin > 300 mg/dL claimed by manufacturer for interference?	Unsubstantiated legacy practice. Perform study. Eliminate Hemastix testing.

Most Common Sources of Waste



Per Day
 771 B12/Fol tests
 5,697 Architect tests
 B12/Fol = 13.5% of total
 75 tubes/b, 10 batches

Per Day
 4,083 HbA1c
 100% of Integra tests
 60 tubes/batch,
 68 batches

Per Day
 1502 uAlb tests
 3,970 ModP tests= 37.8%
 120 tubes/batch,
 12 batches

- 10 B12/Folate batches per day

- 68 batches per day

- 12 urine Microalbumin batches per day

Current State

Beckman Olympus 5400

Required Activities before Testing can be performed

Daily = 30 min
Weekly = 150 min
Monthly = 210 min

30 min
 Instrument Preventive Maintenance

Morning = 60 min
Evening = 0 min
Graveyard = 15 min

15 min
 Reagent replenishment



30 min
 Calibration

30 min
 Quality Control

Legend

Value Stream Map

Green Value Added	Yellow Required NVA	Red Waste
Orange Decision		

Observations:

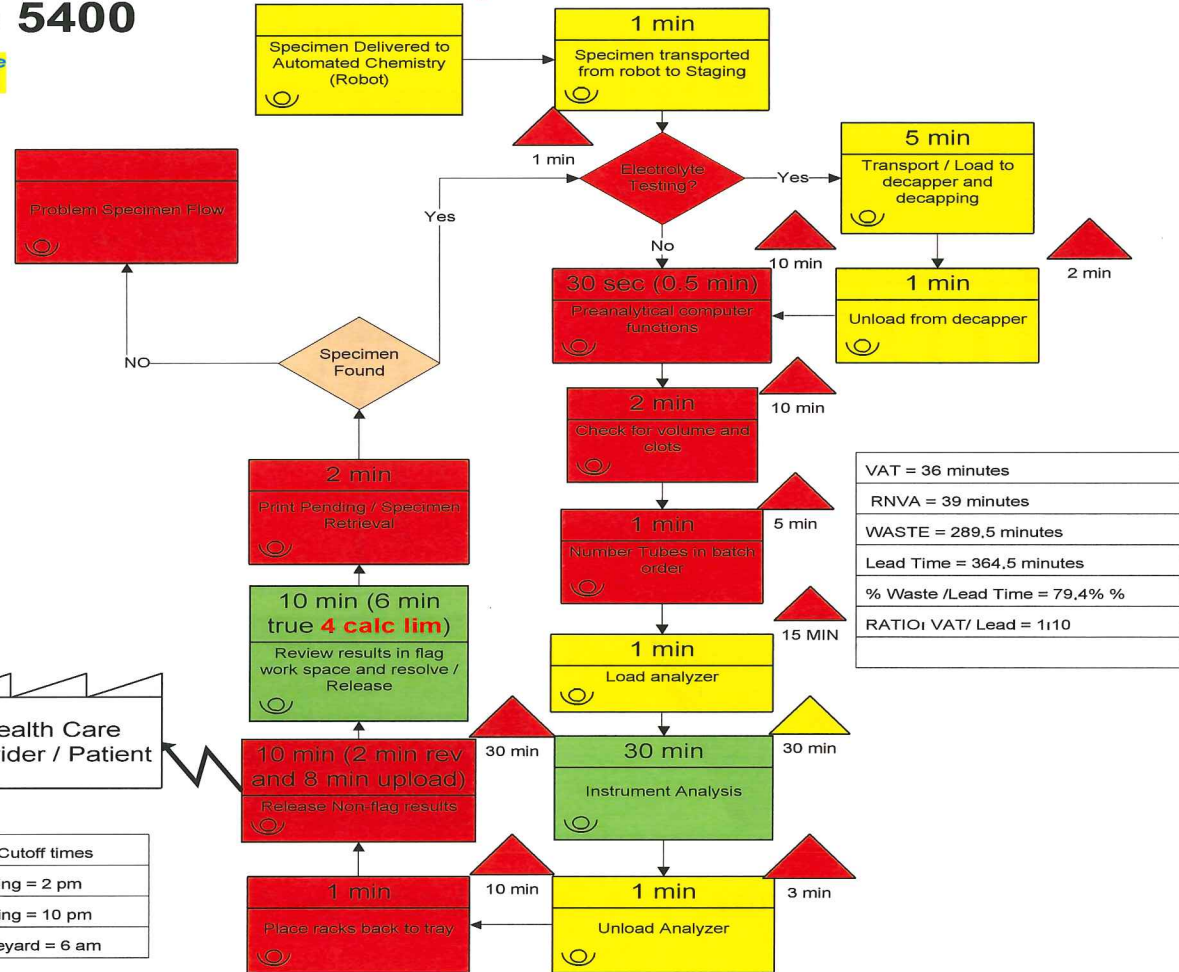
- One batch of 150 specimens photometric
- One batch of 80 specimens electrolytes
- 13000 specimens per day (20% electrolytes)
- Stand-By Mode to reset index and Tech (10 min)

Health Care Provider / Patient

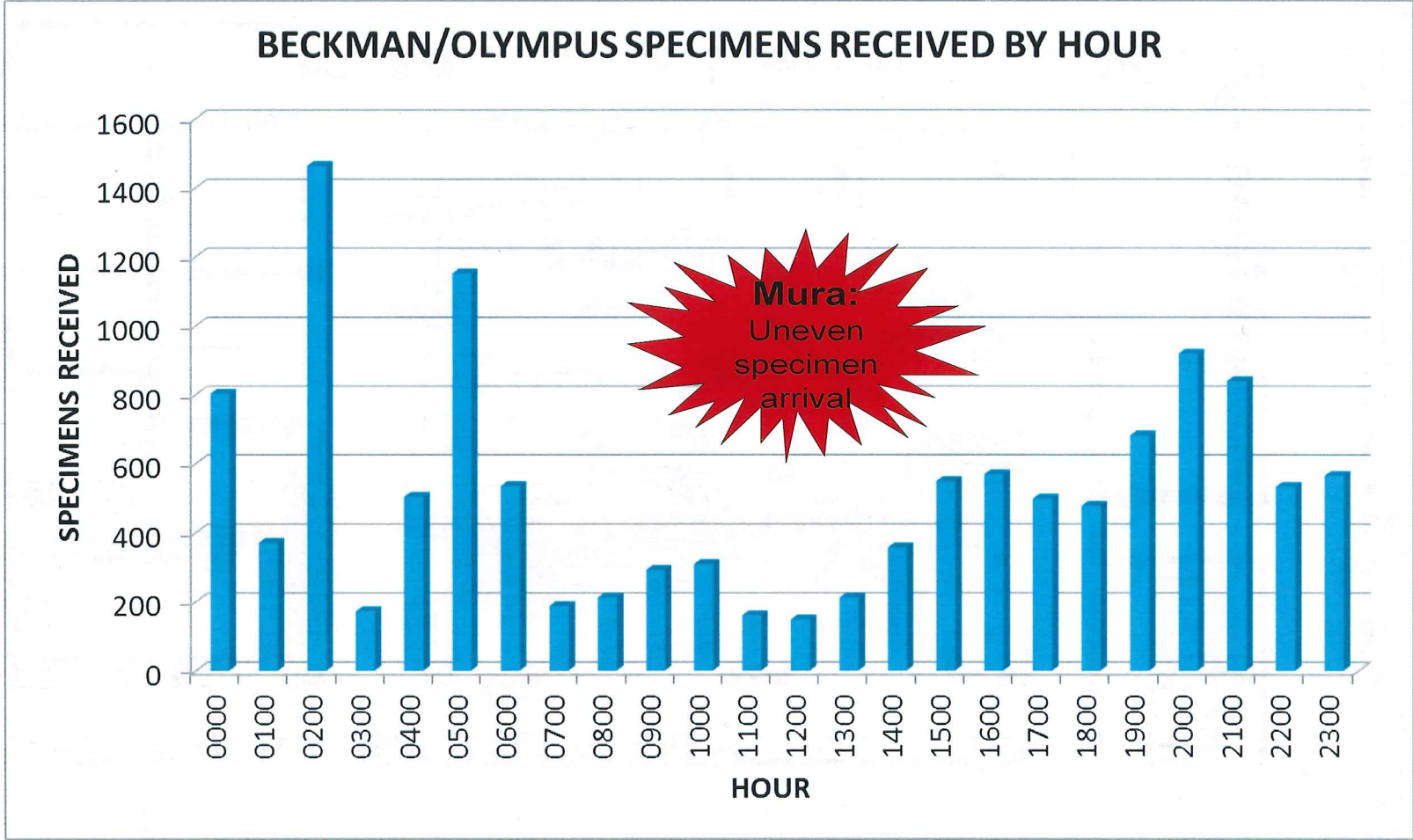
Shift Cutoff times

Morning = 2 pm
Evening = 10 pm
Graveyard = 6 am

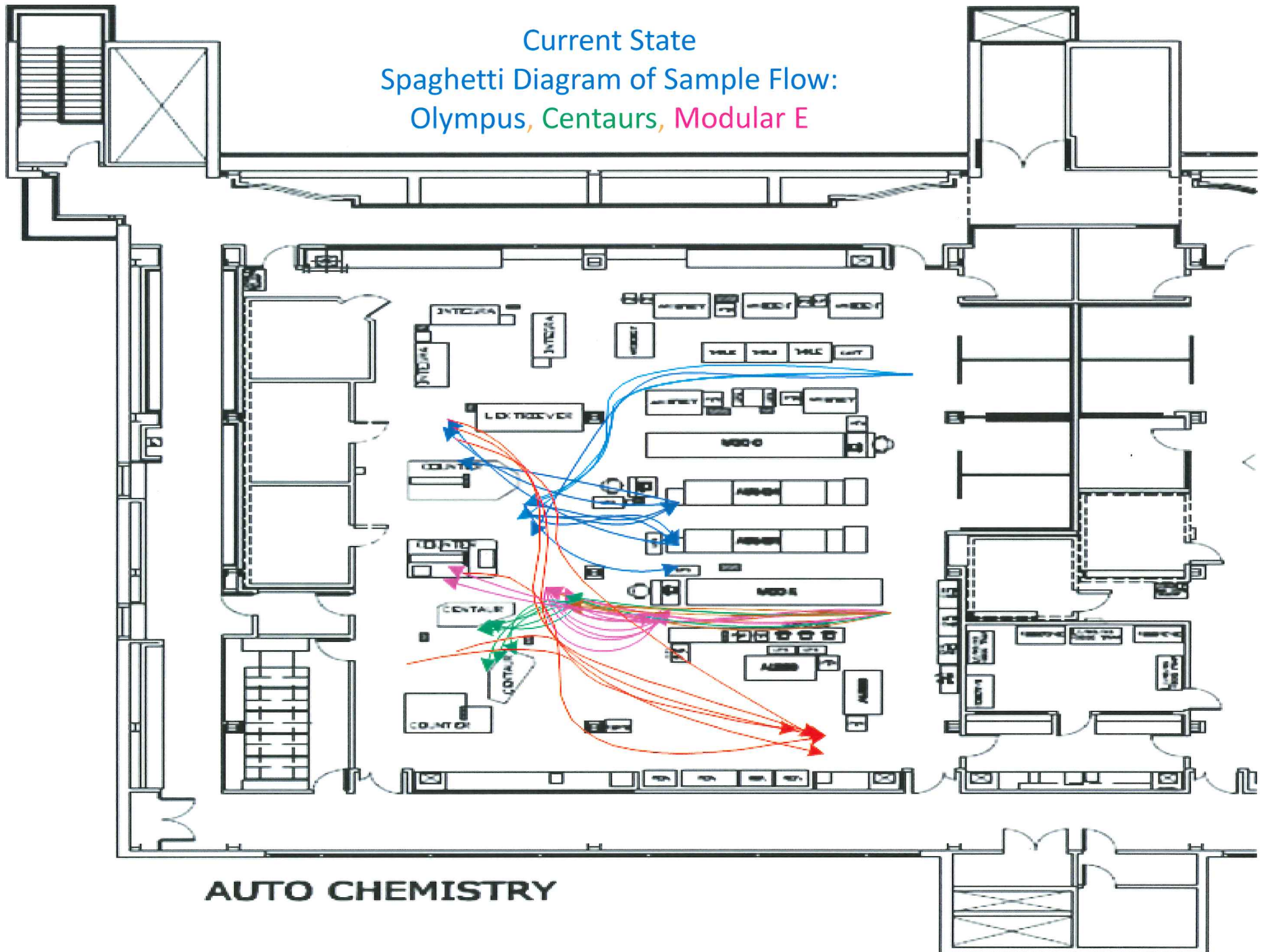
Specimen Flow



VAT = 36 minutes
RNVA = 39 minutes
WASTE = 289,5 minutes
Lead Time = 364,5 minutes
% Waste /Lead Time = 79,4% %
RATIO: VAT/ Lead = 1:10



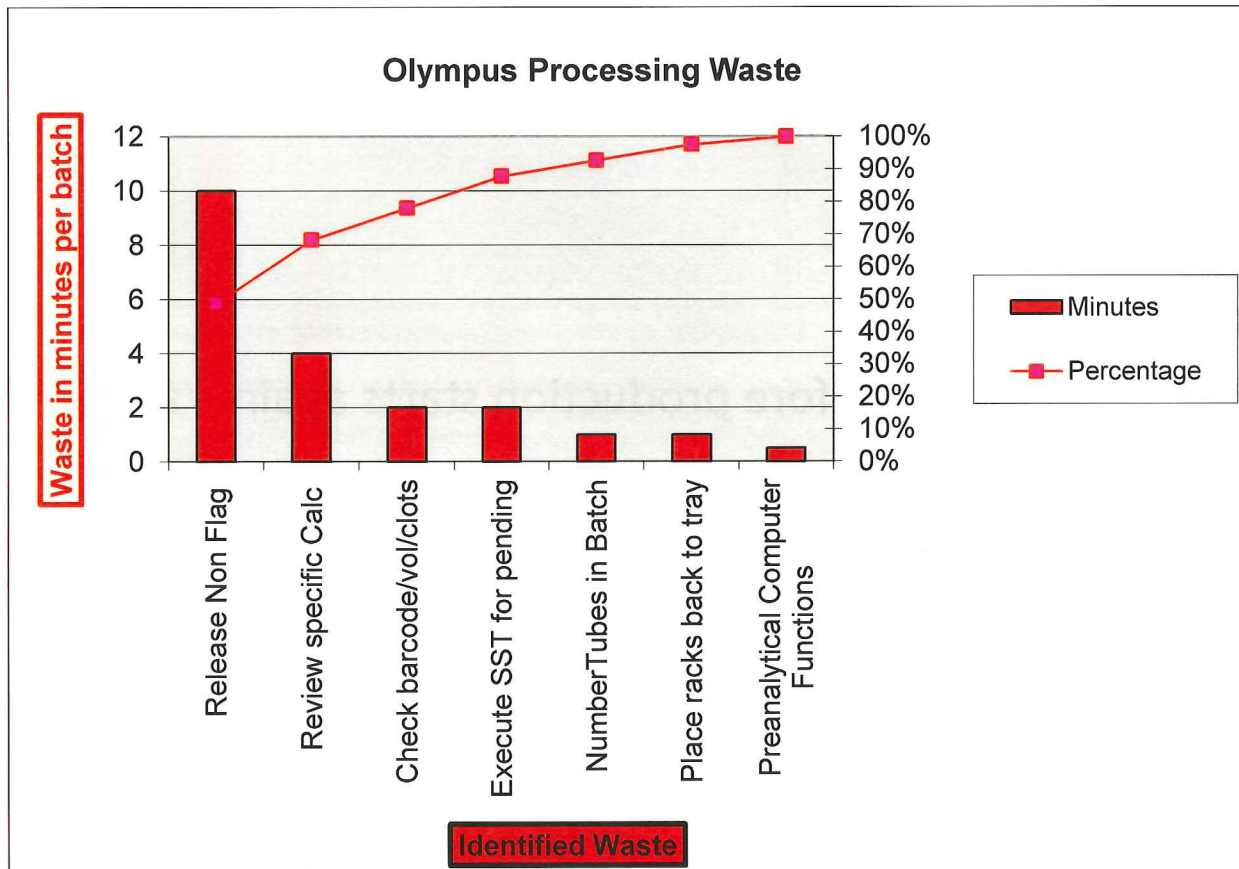
Current State
Spaghetti Diagram of Sample Flow:
Olympus, Centaurs, Modular E



Gemba Observations (Olympus)

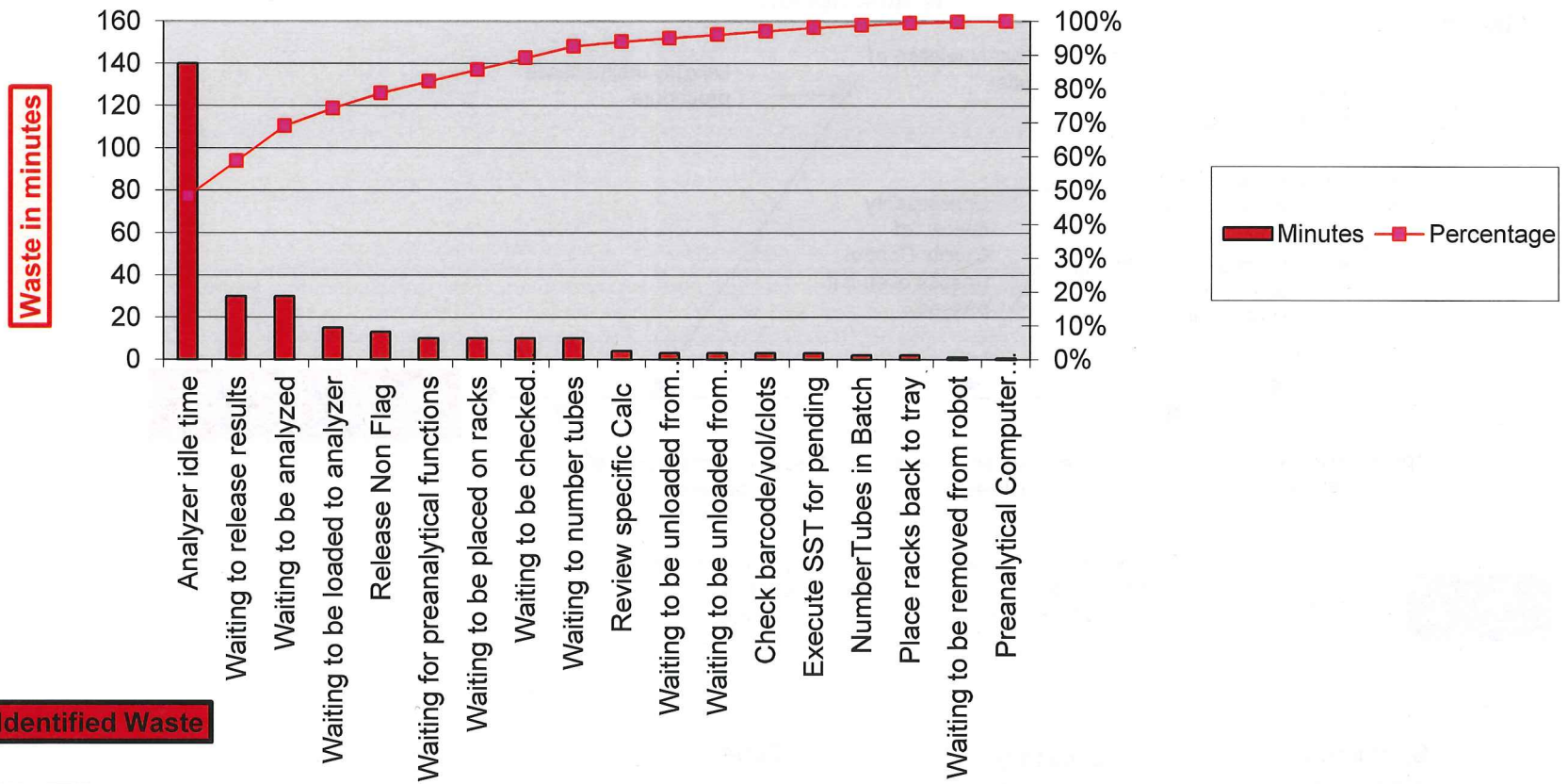
- Test Cut-Off times. 1.5 hours prior to end of each shift resulting in 4.5 hours of analyzer idle time
 - AM shift: 2 PM
 - PM shift: 10 PM
 - Night shift: 6 AM
- 2 1/3 hours of wait time each shift before production starts again – a total of 7 hours analyzer idle time
- Quality Control reagents are loaded at the beginning of the next shift
- Mura: Specimens arrived infrequently and unevenly throughout the day
Specimens often wait 4-5 hours between courier delivery and receipt in lab
- Specimens are distributed to workstations in large batches
- 2 separate tube types, now remediated through continuous improvement.

Gemba Identified Waste for Olympus

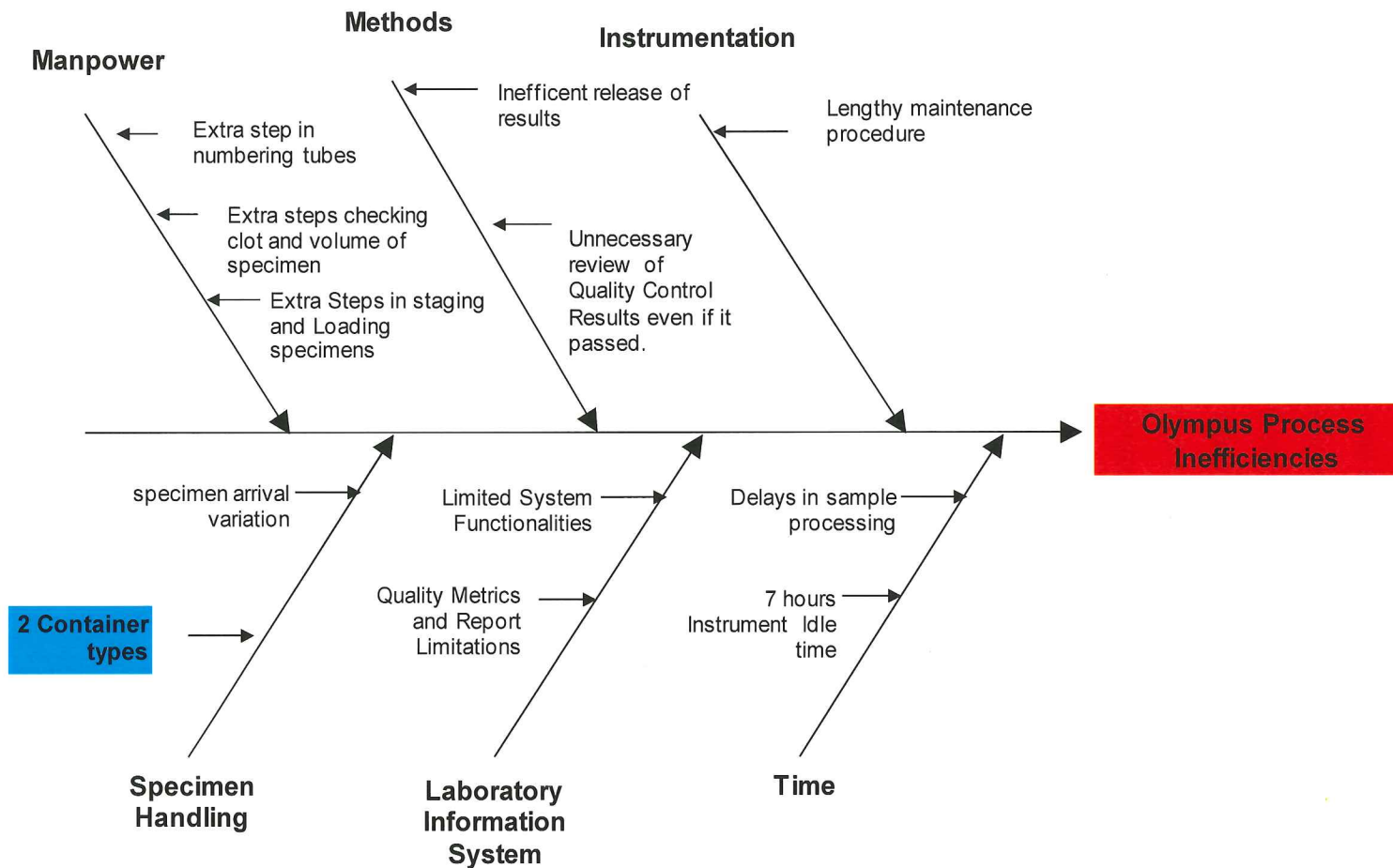


**7 HOURS
 ANALYZER
 IDLE TIME**

Olympus Processing Waste

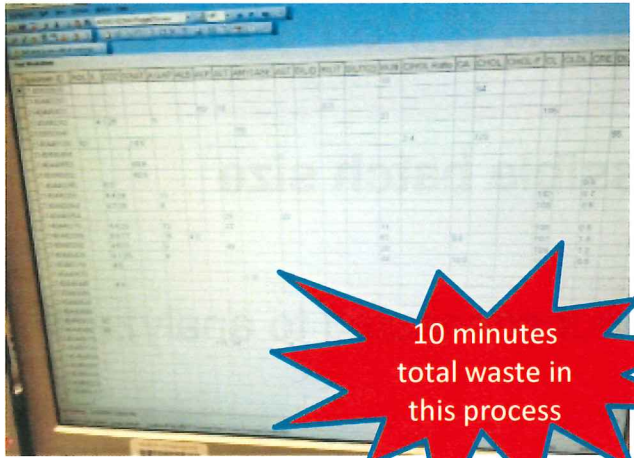
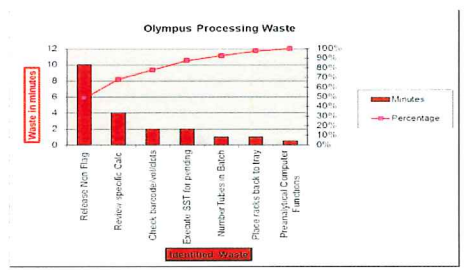


Fishbone Diagram Olympus Process Inefficiencies



Other Gemba Observations (Including Mod E170 and Centaur)

- **Analyzers are not connected to the Labotix automation system**
 - Requires distribution manually or by floor robot
- **Specimens are distributed to workstations in large batches**
- **Centaur Instruments are only run on 2 shifts (8 Hours of idle time)**
- **Lean principles call for the smallest possible batch size**
 - Ideal batch size of 1 tube
 - Cannot be accomplished when automation is not connected to analyzers

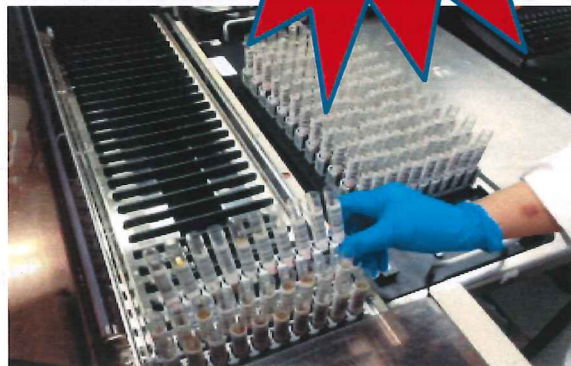


**10 minutes
 total waste in
 this process**

**7 HOURS
 ANALYZER
 IDLE TIME**



Manual process



Wastes



Types	Wastes
Inventories/Waiting	Specimens waiting for analysis - Idle instrument time Paperwork in progress
Excessive Processing/Rework	Retest, redraw or corrected report that could have been avoided
Defects	Data Entry Error Missing or inaccurate information Duplicate order
	Sample Integrity compromised
Mura	Unbalanced processes
Waste of Human Potential	not leveraging peoples' full talents and capabilities Improvement ideas not solicited
Unnecessary motion	Additional effort that adds no value to the service from the patient's viewpoint. Workarounds

LEAN is an extremely powerful tool in identifying and eliminating these wastes.

Lack of Lean tools

Kanban: A method for managing and controlling the movement and ordering of materials in a system.

- Emergency supply requests still occur

Pull: Moving specimens based on a signal from downstream department and process.

- Instrument ready but idle,
- Retrievals for pending tests often take several days

Metrics: Limited availability for general and customized reports.

- Turn Around Time (Throughput) Report

Future State Recommendations, Internal:

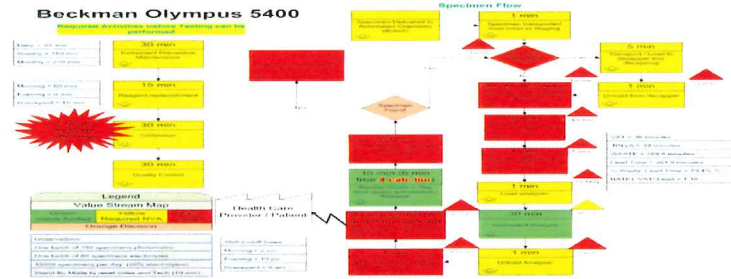
- Stagger the work on the instruments: Perform maintenance, reagent replenishment, calibration and quality control one analyzer at a time
 - ❖ Enables continuous testing
 - ❖ Maximizes throughput
- SPD loads samples directly onto instrument racks (HbA1c, MAU), eliminating manual sample transfers between multiple rack types.
- Hourly sample delivery from SPD.
- Auto-release the majority of results based upon rule-based algorithms.
- Eliminate wasteful Hemastix testing (study justified during LEAN observations)
- Move Modular P assays to AU5400 to improve throughput by 50%.
- Replace two problem prone Integras with two new Integras to increase operating time. (Already approved)

Future State Recommendations, External (Move defect resolution closer to the source):

Provide training and tools to employees to ensure:

- ❖ Correct sample collection containers are utilized every time.
 - Reduce test cancellations due to improperly submitted test samples
 - Cost of Cancellations: 585 Folate cancellations in January of 2014 * \$100 total cost accrued per cancellation = \$58,500
- ❖ Assure that complete test information is provided every time.
 - Urine total volume
 - Urine pH
 - Reduce test cancellations due to improperly submitted test samples
 - Cost of Cancellations: Patients must repeat the 24 hours urine collection when these tests are cancelled due to Kaiser errors omitting required information.
 - Cost of Cancellation: 10 Kidney Stone Formation Diagnostic Panel cancellations in January of 2014 * \$100 total cost accrued per cancellation = \$1000

Ensure hourly sample deliveries regardless of partial or full trays from SPD.

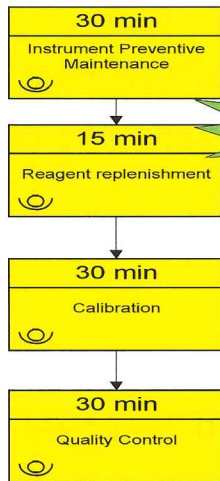


Beckman Olympus 5400 Future STATE

Required Activities before Testing can be performed

Daily = 30 min
Weekly = 150 min
Monthly = 210 min

Morning = 60 min
Evening = 0 min
Graveyard = 15 min



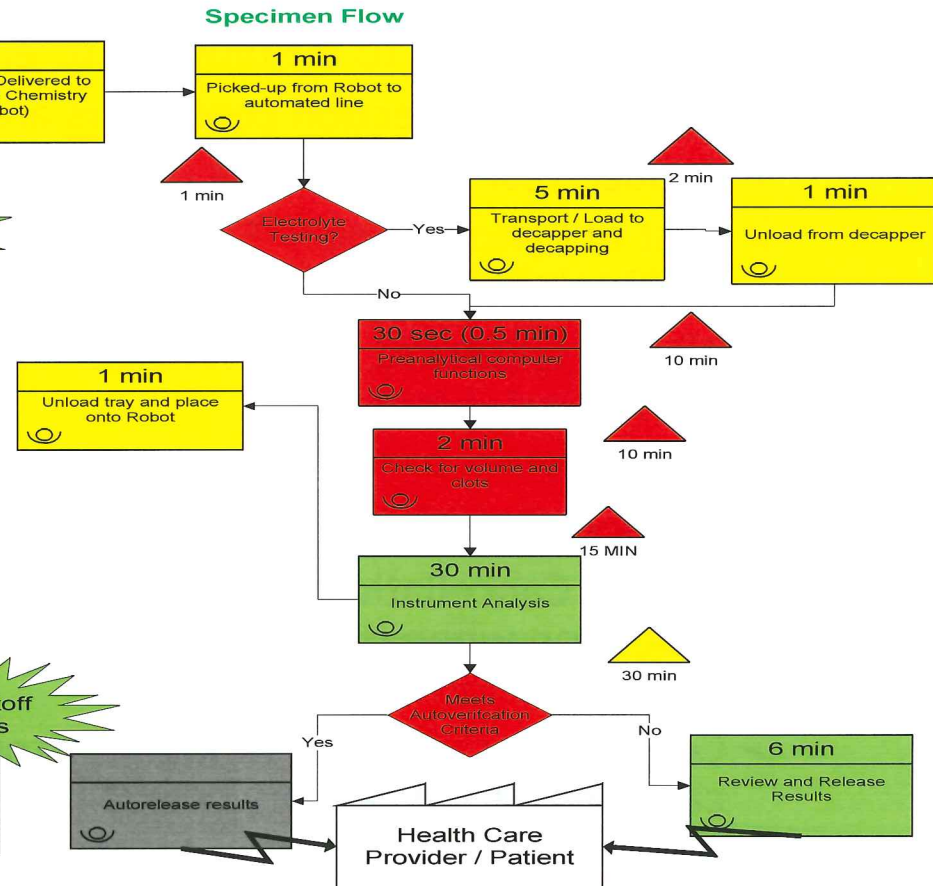
Perform one analyzer at a time

Legend		
Value Stream Map		
Green	Yellow	Grey
Value Added	Required NVA	Automated
Orange Decision		

Observations:
One batch of 150 specimens photometric
One batch of 80 specimens electrolytes
13000 specimens per day (20% electrolytes)
Stand-By Mode to reset index and Tech (10 min)

Shift Cutoff times
Morning = 2 pm
Evening = 10 pm
Graveyard = 6 am

No cutoff times



Olympus 5400 – Time Value Chart



Current State : 364.5 minutes

Ratio 1:10

	1 min	1 min	2 min	5 min	2 min	1 min	10 min	0.5 min	10 min	2 min	5 min	1 min	140 min	15 min	1 min	30 min	30 min	3 min	1 min	10 min	1 min	10 min	10 min	30 min	10 min	2 min
Spec Delivered	Wait	Specimen transported from robot to Staging	Wait	Transport / Load to decapper and decapping	Wait	Unload from decapper	Wait	Preanalytical computer functions	Wait	Check for volume and clots	Wait	Number Tubes in batch order	Instrument Idle Time	Wait	Load analyzer	Wait	Instrument Analysis	Wait	Unload Analyzer	Wait	Place racks back to tray	Wait	Release Non-flag results	Wait	Review results in flag work space and resolve / Release	Print Pending / Specimen Retrieval
	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺

Future State: 140.5 minutes

Ratio 1:4

	1 min	1 min	2 min	5 min	1 min	10 min	0.5 min	10 min	2 min	15 min	1 min	30 min	30 min	1 min	1 min	10 min
Spec Delivered	Wait	Specimen transported from robot to Staging	Wait	Transport / Load to decapper and decapping	Unload from decapper	Wait	Preanalytical computer functions	Wait	Check for volume and clots	Wait	Load analyzer	Wait	Instrument Analysis	Unload Analyzer	Place racks back to tray	Review results in flag work space and resolve / Release
	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺

Ideal State: 36 minutes

Ratio 1:1

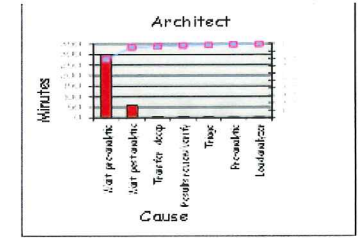
	30 min	6 min
Spec Delivered	Instrument Analysis	Review results in flag work space and resolve / Release
	☺	☺

Shift Cutoff times
Morning = 2pm
Evening = 10pm
Night = 6am



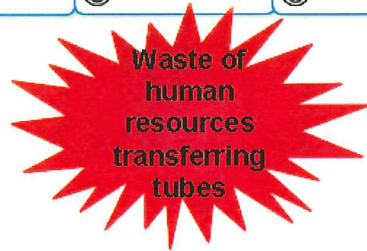
Current vs Future State Map - Comparison

Architects



Current State

150 min	3 min	300 min	5 min	80 min	2 min	113 min	60 min	5 min
Regulatory activities performed on all 6 analyzers at once, at the start of each shift. Patients waiting.	Samples are removed from the robot and delivered to the Architect testing area	Samples waiting as all analyzers are prepared for testing	Folate and B12 samples must be decapped and transferred from SPD's foam racks to instrument racks before testing	Samples waiting to be loaded onto analyzers	Samples are loaded into 3 of 6 analyzers. Reagents are onboard for 3 analyzers only to minimize calibration and QC activities	Analyzer performs tests	Results waiting for CLS/MLT review and release	CLS / MLT reviews each test result and reports to Health Connect



1:6

VAT = 113 min
Lead Time = 718 min

Future State

3 min	2 min	113 min	60 min	5 min
Samples are removed from the robot and delivered to the Architect testing area	Samples are loaded onto analyzer	Analyzer perform tests	Results waiting for CLS/MLT review and release	CLS / MLT reviews each test result and reports to Health Connect



1:2

VAT = 113 min
Lead Time = 183 min

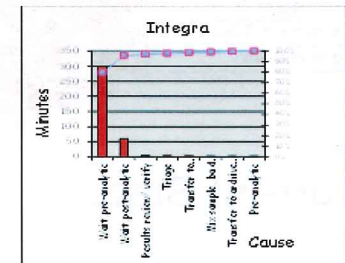
Eliminate sample transfers and decapping. Workflow optimization. B12 and Folate reagents loaded on all 6 analyzers to improve TAT.

Shift Cutoff times
Morning = 2pm
Evening = 10pm
Night = 6am



Current vs Future State Map - Comparison

Integras



Current State

125 min	3 min	840 min	3 min	70 min	2 min	20 min	60 min	5 min
Regulatory activities performed on all 3 analyzers at once, at start of each shift. Patients waiting.	Samples are removed from the robot and delivered to the Integra testing area	Samples may wait up to 14 hours because testing is performed on 2 shifts only	HbA1c samples must be transferred from SPD's foam racks to instrument racks	Samples waiting its turn to be loaded into the analyzers	Samples are mixed right before loading onto analyzers	Analyzer performs tests	Results waiting for review and release	CLS / MLT reviews each test result and reports to Health Connect



1:56

VAT = 20 min

Lead Time = 1128 min

Future State

3 min	420 min	2 min	20 min	1 min
Samples are removed from the robot and delivered to the Integra testing area	Samples may wait up to 7 hrs because testing is performed on two shifts only	Samples are mixed right before loading onto analyzers	Analyzer performs tests	In FSM, HbA1c results are autoverified. <5% require CLS review.



1:22

VAT = 20 min

Lead Time = 446 min

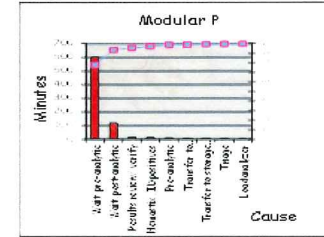
Eliminate sample transfer by having SPD load directly onto analyzer racks.
Using software, autoverify >95% of HbA1c results, minimizing human intervention.

Shift Cutoff times
Morning = 2pm
Evening = 10pm
Night = 6am



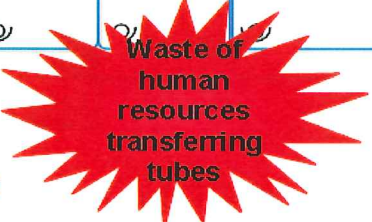
Current vs Future State Map - Comparison

Modular P



Current State

160 min	2 min	600 min	3 min	2 min	10 min	2 min	1 min	30 min	2 min	35 min	120 min	15 min
Regulatory activities performed on analyzer at start of each shift. Patients waiting.	Samples are removed from the robot and delivered to the Modular P testing area	Samples waiting while the single analyzer is being prepared for testing	Urine microalbumin samples are transferred from SPD's yellow racks to instrument racks, and numbered.	Samples wait to be Hemastix tested	30-50% of microalbumin samples are tested manually with Hemastix for hemolysis assessment. Of these samples, about 6% are positive for hemolysis.	Samples identified as hemolyzed	The hemolyzed samples are identified for tracking and CLS review and verification.	Samples wait to be loaded into analyzer	Samples are loaded into analyzer	Analyzer performs tests	Results waiting for review and release	CLS / MLT reviews each test result and reports to Health Connect



Future State

160 min	2 min	300 min	2 min	35 min	120 min	15 min
Regulatory activities performed on analyzer at start of each shift. Patients waiting.	Samples are removed from the robot and delivered to the Modular P testing area	Samples waiting while the single analyzer is being prepared for testing	Samples are loaded into analyzer	Analyzer performs tests	Results waiting for review and release	CLS / MLT reviews each test result and reports to Health Connect



Eliminate sample transfers by having SPD place samples directly into the instrument racks. Replace slower Mod P with **AU5400**. Improve TAT by 50%.
Eliminate Hemastix testing for hemolysis.

1:28

VAT = 35 min
Lead Time = 982 min

1:18

VAT = 35 min
Lead Time = 634

Future State Map

Start

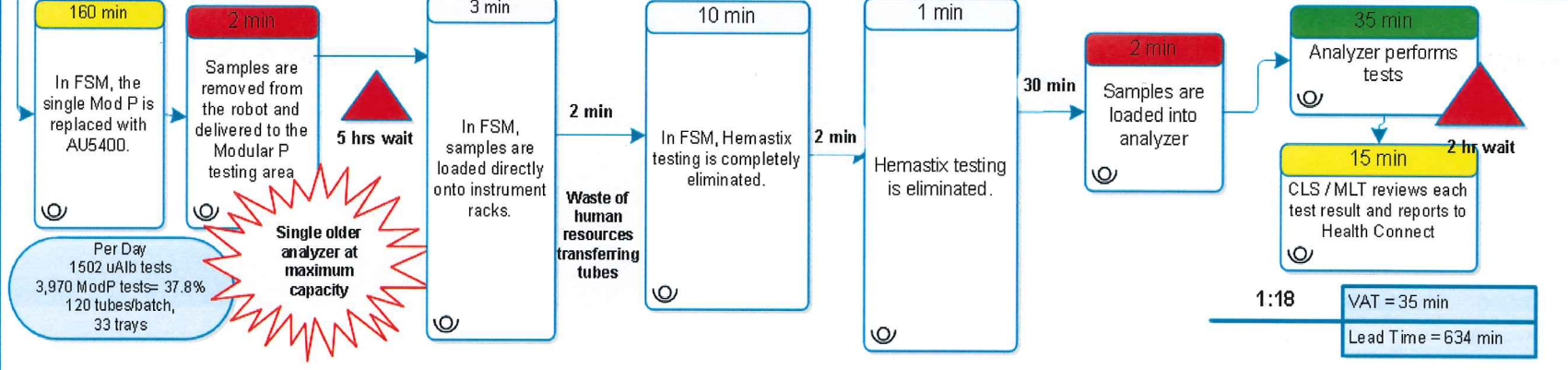
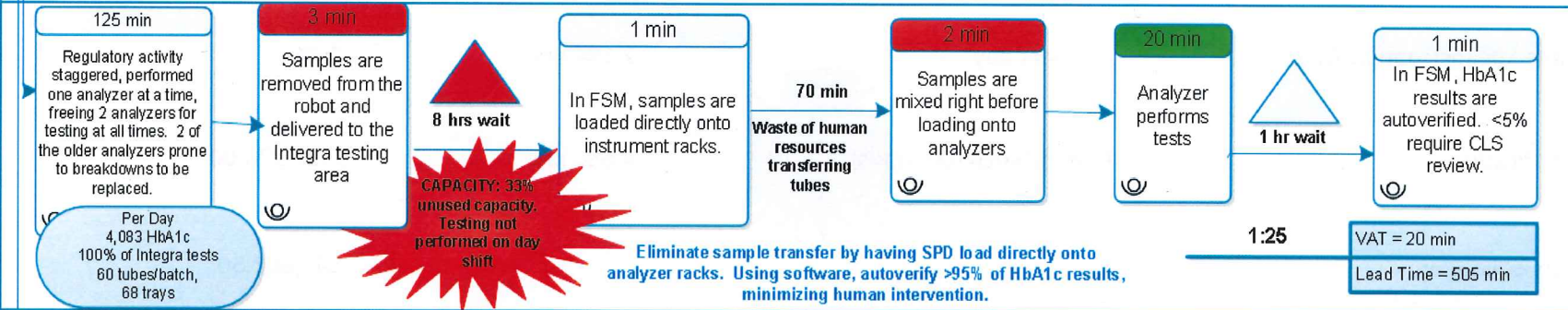
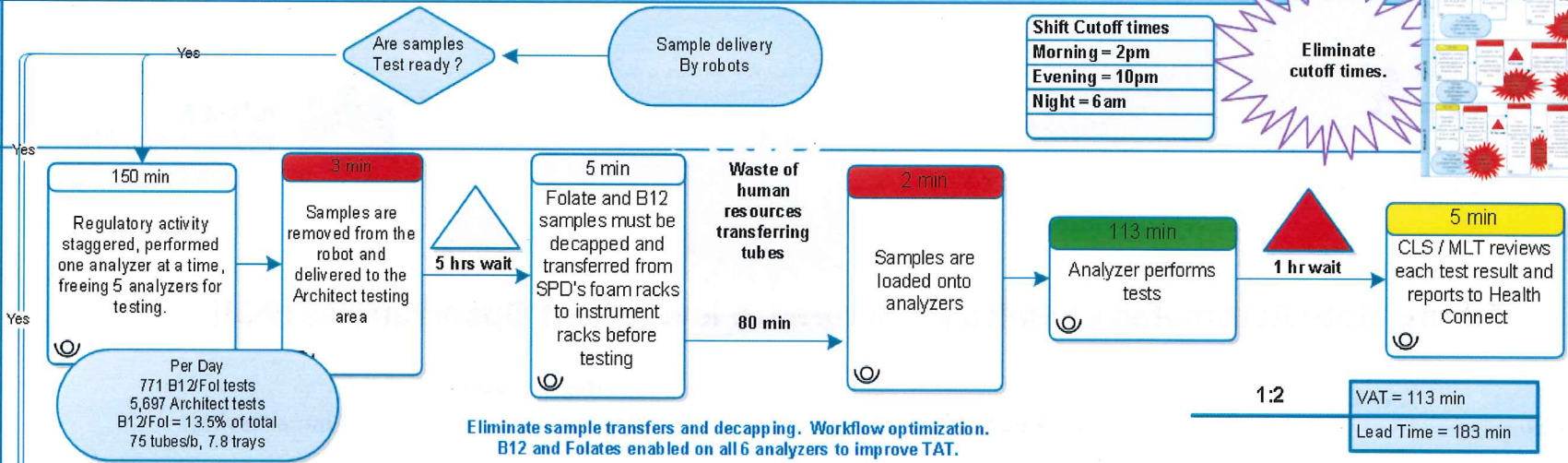
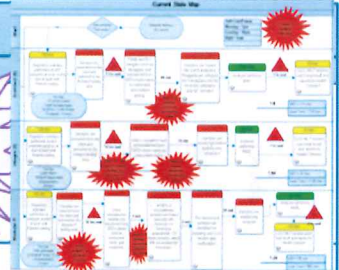
Architect (6)

Integra (3)

Modular P

Shift Cutoff times
Morning = 2pm
Evening = 10pm
Night = 6am

Eliminate cutoff times.



Future State Automated Chemistry - Return On Investment Opportunities (ROI)

Changes	Eliminated Waste	Eliminated Waste, Per Year	Annual Savings
Eliminate Idle Instrument Time	7 hours / day	2,184 hrs.	29%
Autoverification	10 min/batch (Olympus)	4,680 hrs.	\$322,920.00
Tube Consolidation			\$42,861.50
Total Savings			\$365,781.50

Future State

Simple Payback Period (SPP) for Autoverification

- Implementation Cost = \$ 300,000.00
- Net annual Savings = \$ 300,000.00
- Autoverification Pay Back: 1 Year

$$\$300K \div \$300K/Yr = 1 \text{ Year}$$

Ideal State Recommendations – Automation Line

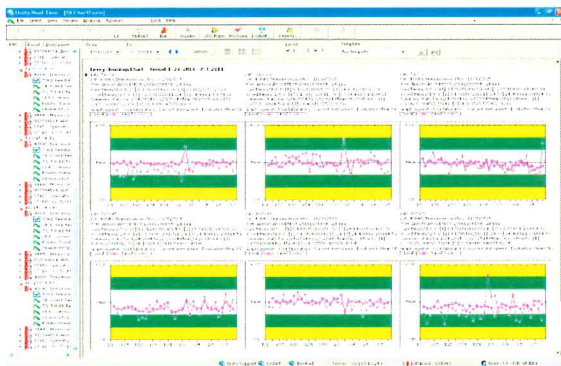
- » Automation Line which will connect any type of analyzer (open architecture)
- » Automating & connecting all chemistry and immunoassay tests (Consolidation)
- » Benefits
 - ❖ Consolidate instrument platforms (eliminate Centaur, Roche Mod E, Mod P)
 - ❖ Consolidate of tests (thyroids, anemia, fertility, tumor, etc) on these platforms
 - ❖ Resulting in reduction of phlebotomy draws
 - ❖ Improve turn around time (TAT): customer satisfaction
 - ❖ Fewer platforms to maintain, reduce service contract costs
 - ❖ Reduce storage space for reagents

Ideal State Recommendations - Middleware

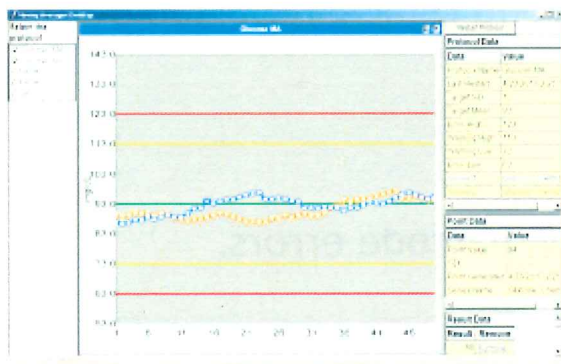
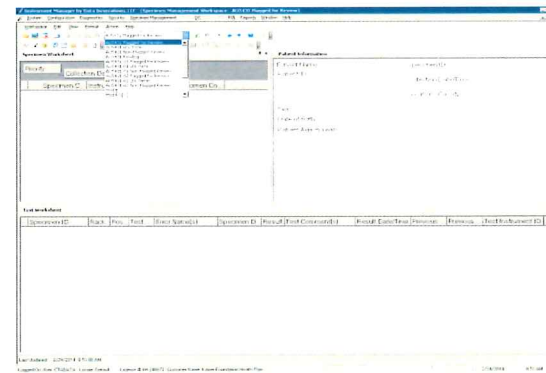
- Connect all analyzers to Data Innovations middleware.
- Enable **autoverification** of > 95% of results, write rules to manage the remaining 5% of results requiring investigation.
 - ✓ Write rules using IF, THEN logic for all analyzers/assays for managing:
 - Reflex testing → Test B
 - Repeats with dilutions
 - Samples to be routed to specific output module for intervention, investigation
 - Clots: This number will reduce due to LEAN improvements at the medical centers.
 - High serum index
 - Unexpectedly very low or high results. Beyond clinical reportable range.
 - Call criticals to email, smart phones, iPADS
 - Light poles (andon) when analyzers are experiencing
 - Software or hardware error codes, including barcode errors.
 - Non-operating (no patient input) time

Ideal State Recommendations – Command Centers

- Use instrument emulators to enable ‘command center’ style workstations where multiple instrument that generate thousands of tests per shift can be managed via multiple monitors per workstation:



Comparing
 TSH QC
 across 6
 Architect
 analyzers at
 once

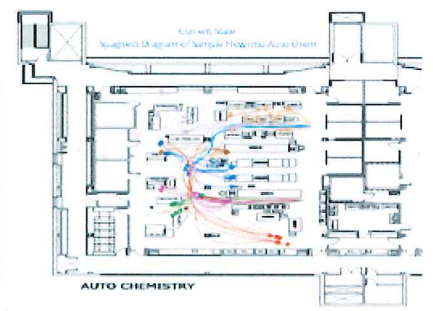
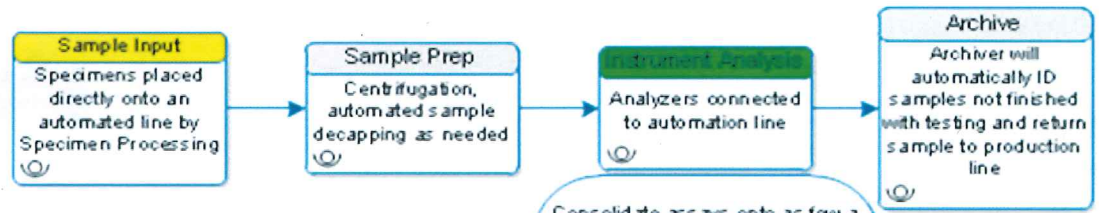


Comparing
 patient moving
 average for
 specific analytes
 across all
 analyzers at once

Use rules for Data
 Innovations’ Notifier to define
 how and when users will be
 notified by email, Windows
 popup message, or use a **Light
 Pole** for audio and visual
 reminders (andon).



Ideal State Map

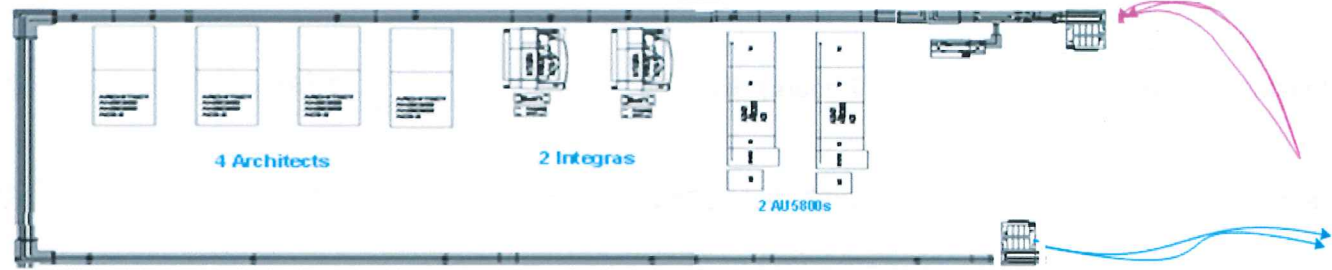
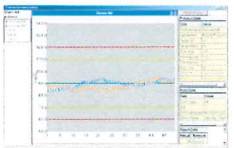


Consolidate assays onto as few a platform as possible. Eliminated Centaurs and Roche Modulars.

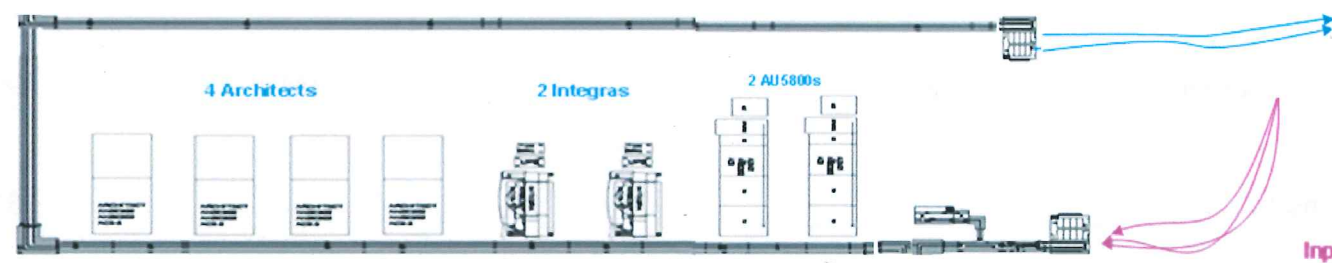
Perform urine chemistries on one AU per line for continuous patient testing.

Minimize TAT:
Perform regulatory activities on: 1 analyzer Per platform Per automated line at a time.

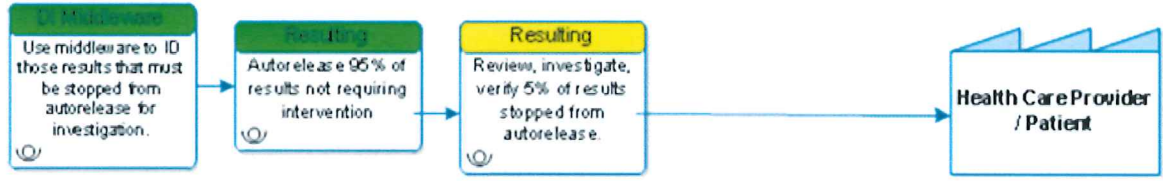
- Preventive Maintenance
- Reagent Replenishment
- Calibration
- Quality Control



Output directly to Archiver



Input directly onto automated track

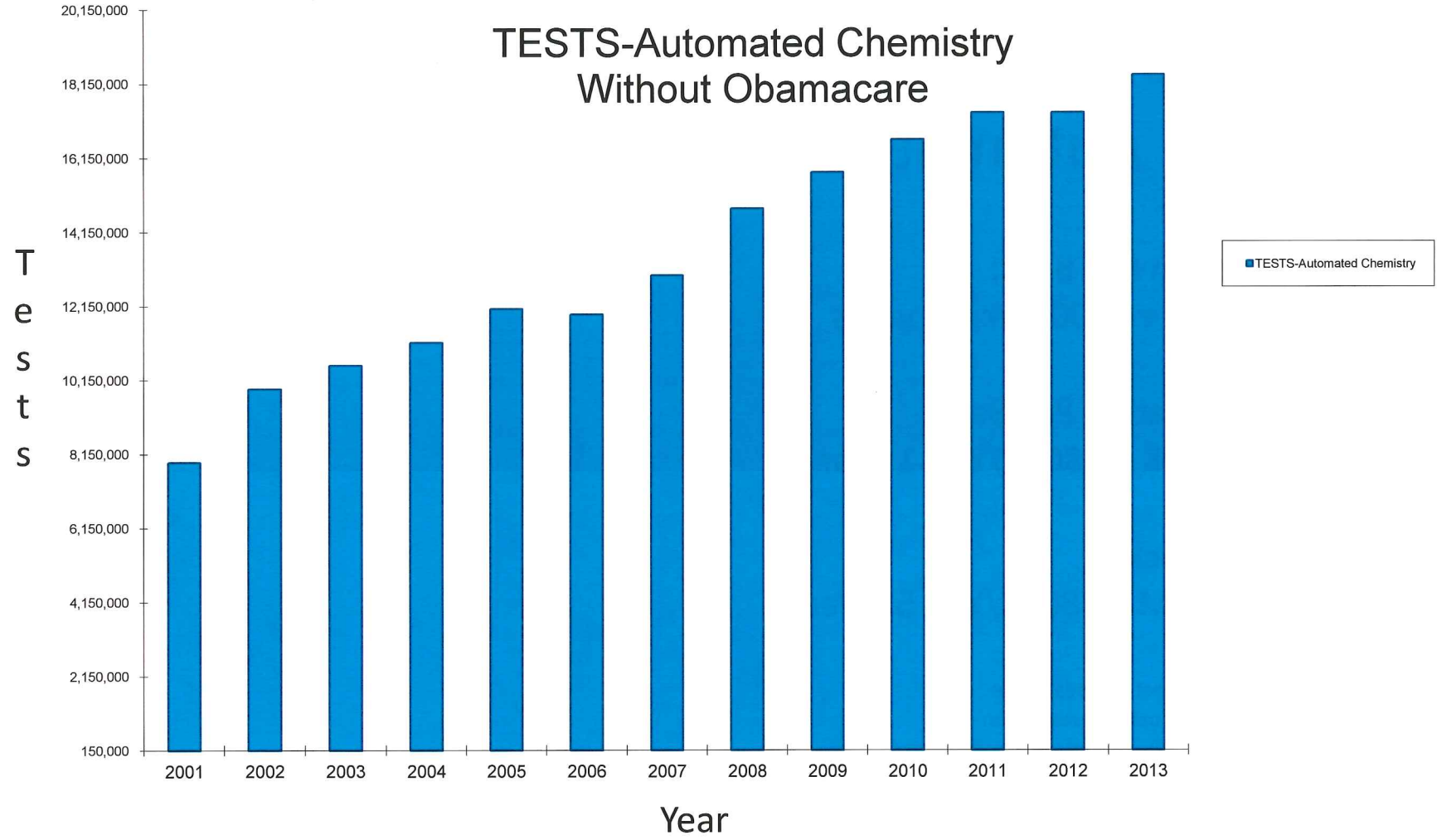


Ideal State Automated Chemistry - Return On Investment Opportunities (ROI)

	Eliminated Waste	Eliminated Waste, Per Year	Annual
Eliminate Idle Instrument Time	7 hours / day	2,184	29%
Automation	14976 hours/ year	14,976	\$516,672.00
Autoverification	10 min/batch (Olympus)	4,680	\$322,920.00
Platform Consolidation		7,488	\$430,560.00
Tube Consolidation			\$42,861.50
Total Savings			\$1,313,013.50

Simple Payback Period (SPP) for Automated Chemistry

- Automation Pay Back:
 $\$4\text{M} \div \$500\text{K}/\text{Yr} = 8 \text{ years}$
- Autoverification Pay Back:
 $\$300\text{K} \div \$300\text{K}/\text{Yr} = 1 \text{ year}$
- Total Payback:
 $\$4.3\text{M} \div \$800\text{K}/\text{Yr} = 5.4 \text{ Years}$
- Implementation Cost for Ideal State
\$4M – Cost of Automation
\$300,000– cost of autoverification set-up



PERFECTION



*** Ultimate goal is to provide a perfect process with zero waste.**

- **Lean Principles:**

- ❖ Focus on continuous improvement. Eliminate waste.
- ❖ To do this, we must strive to make all imperfections visible.

- **Lean Results:**

- ❖ Reduce batch sizes. Hourly sample delivery.
- ❖ Process levelling: Continuous specimen arrival – If not - staffing schedules matched to neutralize variation
- ❖ Standardization of work processes with visual cues to help people maintain continuous testing
- ❖ Root cause analysis and mistake-proofing to reduce defects due to human error
- ❖ Improved real time metrics that will help track operations
- ❖ Automate when possible

PERFECTION

*** Ultimate goal is to provide a perfect process with zero waste.**

Maximize functionalities of Middleware/ and or Laboratory Information System which will be viewable in a large screen(1-4). The software and hardware currently exists, we just need to find time to design and deploy:

To make imperfections visible (errors, defects, problems):

1. To alert, stop patient testing with **QC failures** or significant shifts in QC
2. To alert, stop patient testing with significant shifts in **patient moving averages**
3. To alert on **backlog** and TAT trends
4. To alert **Instrument Idle Time**

Reports that provide real time data driven metrics:

1. Turnaround Time Reports
2. Productivity Reports
3. Cancellation Reports
4. Critical Value Reports
5. Other Customized Reports as needed

People – The Heart of Lean

The National Agreement between Kaiser Permanente and the Coalition of KP Unions took effect in 2012. As in the last two national agreements, unit-based teams composed of labor and management representatives, remain Kaiser Permanente's strategy for continuous performance improvement, frontline engagement and collaboration.

KP believes in the engagement of employees in the design and implementation of work. We believe that it creates a healthy work environment and builds commitment to superior organizational Performance. ***To these teams, LEAN provides a methodology to identify waste and work smarter.***

- ❖ planning and designing work processes (Lean Thinking)
- ❖ setting goals and establishing metrics
- ❖ reviewing and evaluating aggregate team performance
- ❖ budgeting, staffing and scheduling decisions
- ❖ proactively identifying problems and resolving issues.

Improvement Summary



	Current State	Future State	Ideal State
Olympus 5400 Total Lead Time 150 samples	364.5 min	140.5 min 60.5%	36 min 90.1%
Architect Total Lead Time Folate/VB12 samples	718 min	183 min 74.5%	115 min 84%
Integra Total Lead Time	1128 min	446 min 60%	55 min 95%
Modular P Total Lead Time Urine Microalbumin	982 min	634 min 35.4%	170 min 82.7%
Total Minutes	3192.5	1403.5	376
Reduction of Waste	-	Δ -1789 min/d 56%	Δ -2816.5min/d 88%
Quality	Mod	High	High
Frustrations of Staff	High	Mod	Low
Frustrations of MDs	Mod	Low	Low
Frustrations of Patients	Mod	Low	Low

Personal Reflections



The LEAN class has provided me with a new way of understanding our laboratory. From gemba (the real place, real people) observations to the application of LEAN tools that help us to identify and measure, the frustrations and the sources of waste.

It is empowerment and gratitude that I feel.

That Kaiser Permanente would select me to take classes so that we can make our own work environment better. Less clutter, defects, variability. More productive, streamlined and empowered.

Gratitude that we already work in a partnership environment such that collaboration is not only encouraged, but is written into our National Agreement.

We hope that this is the beginning of a new philosophy, a new way of thinking and living. That we will be supported in our continuous improvement to share what we have learned, to collaboratively identify more waste, more areas where we can work smarter.

What can a healthcare system learn from an automaker?

- Need leadership that is truly committed, transforming through hands-on-learning and gemba observations.
- Open mind and collaborative spirit
- Cost Avoidance
- Single Piece Flow
- Improving Measurable Performance
- Measuring Cost
- Resource Optimization
- Processing Levelling – Heijunka
- Within the constraints of technology
- Increase Understanding and Insight - Awareness – opportunity to learn- Knowledge-Capability – Execute Improvement Process – Mobilization - Implementation