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# Waste Reduction in an Interdependent System through Standardization and Lean Thinking- Chlamydia/GC Testing: Lean Improvements

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# Waste Reduction in an Interdependent System through Standardization and Lean Thinking

## Chlamydia/GC Testing: Lean Improvements

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Course SELP 695-02

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- Current Workflow and Turnaround Time
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# The Virology Laboratory – An Overview

## Services

- ✓ Comprehensive diagnostic Virology Laboratory
- ✓ ~ 800,000 samples per year
- ✓ Molecular testing: *Mycobacterium tuberculosis* TMA, Chlamydia/GC (CT/GC) TMA, *C. difficile* PCR, Enterovirus PCR, and Respiratory Panel PCR (Inpatient), and Influenza A and B PCR (Outpatient)

## Highlights

- ✓ **High volume testing for CT/GC (~2000/day, >430,000/year)**
  - ✓ Ensures appropriate diagnosis and prevention



CT/GC Testing on  
the Tigris Instrument



## CT/GC Testing Project Focus : Listening to the Voice of the Customer

### 🌐 Customers

- ✓ Patients/members
- ✓ Healthcare providers

### 🌐 Goals

- ✓ Minimize test delays
- ✓ Issue error free results
- ✓ Decrease Turn-Around-Time

### 🌐 Value

- ✓ Improved result turnaround time
- ✓ Improved patient care
- ✓ Increased member satisfaction
- ✓ Increased provider satisfaction

### 🌐 Chlamydia/GC (CT/GC) Testing Statistics:

- ✓ >430,000 tests performed annually
- ✓ Operations (2 day shifts):
  - 1st: 5 am to 1:30 pm (7 CLS)
  - 2nd: 10 am to 6:30 pm (7 CLS, 1 R&D CLS)
- ✓ Staff: 15 licensed, 2 support staff, 1 Section Manager, 1 Assistant Director of Laboratory Services, 1 Director of Laboratory Services

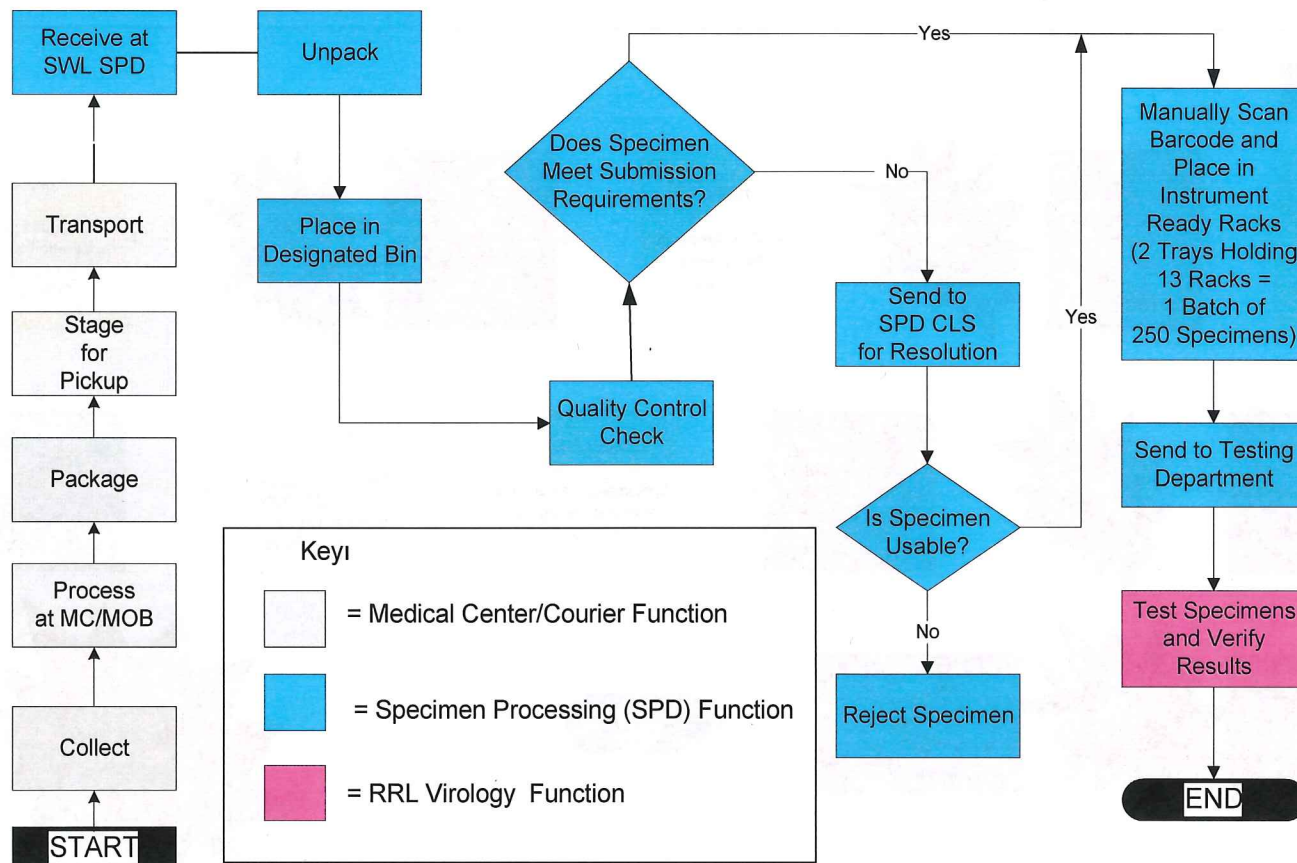
**Quality Testing**

**Error Free**

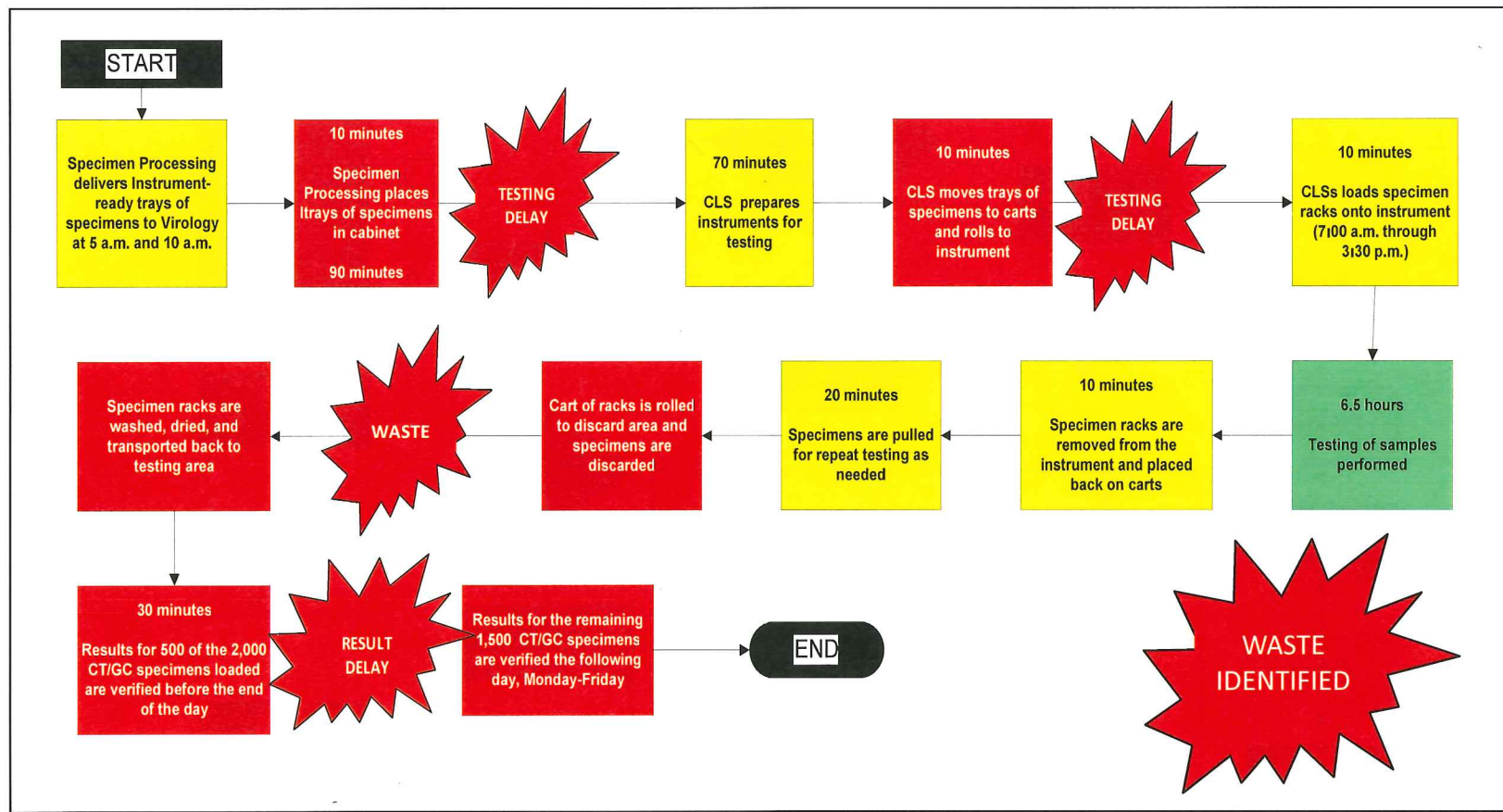
**On Time**

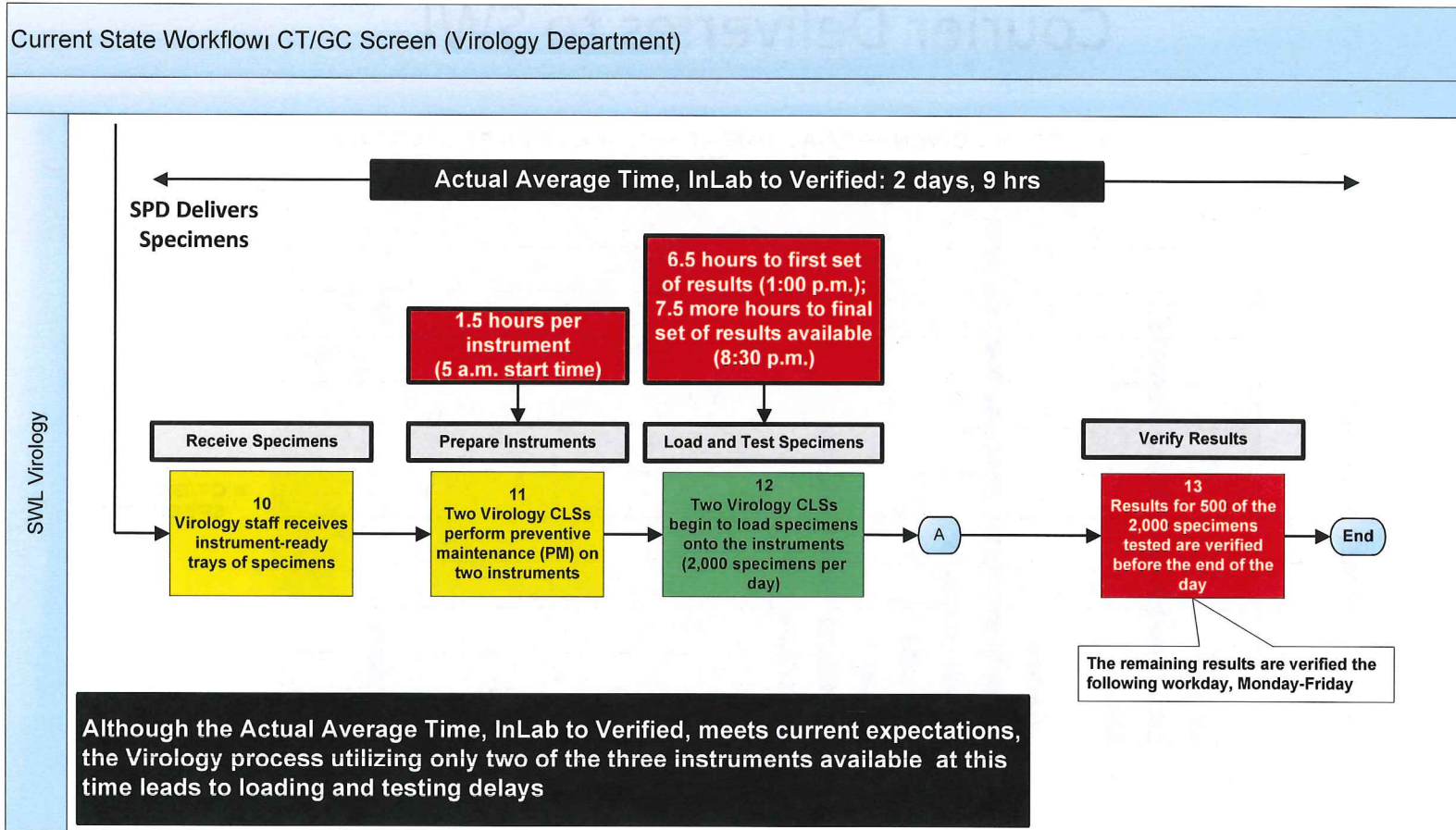
**Every Time**

## CT/GC Overview of Process: (Collection to Result Verification)



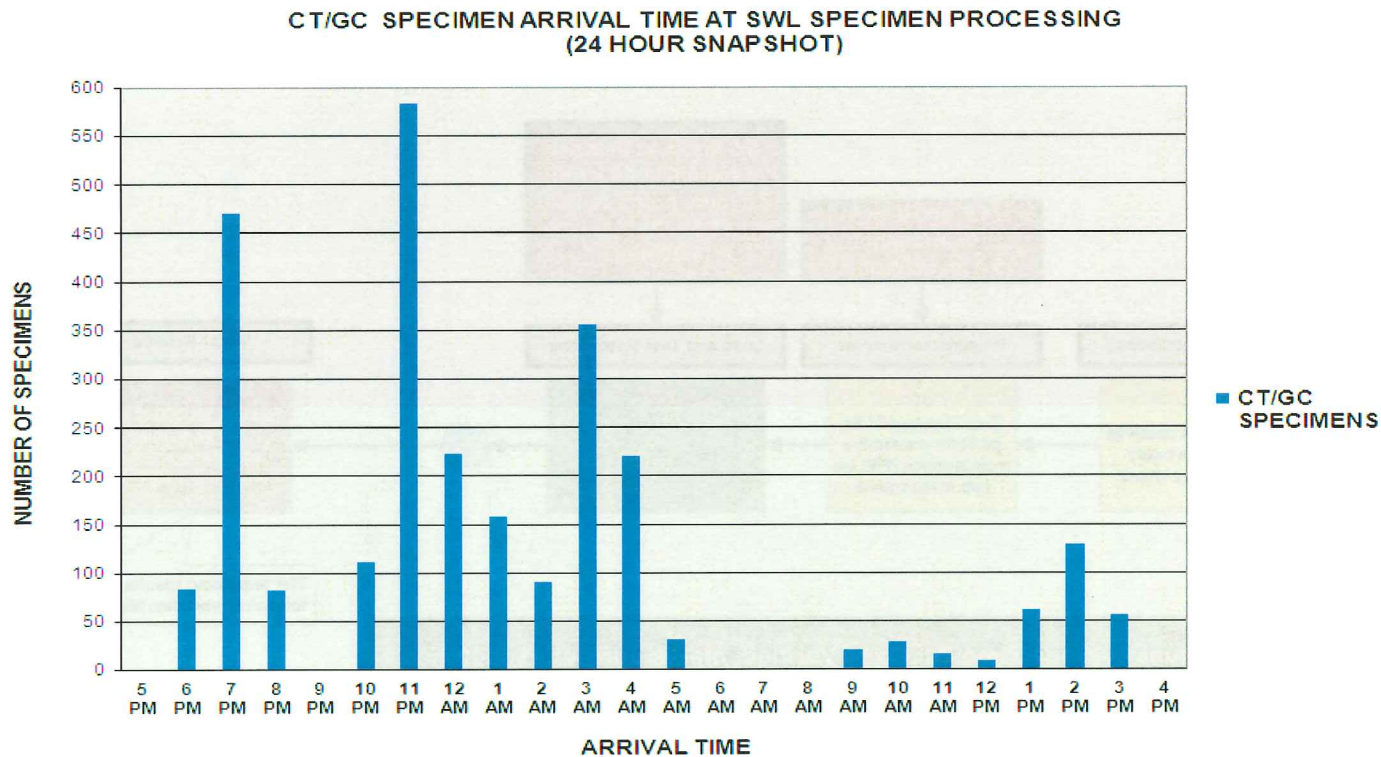
# CT/GC Workflow In Virology Department







## Courier Deliveries to SWL



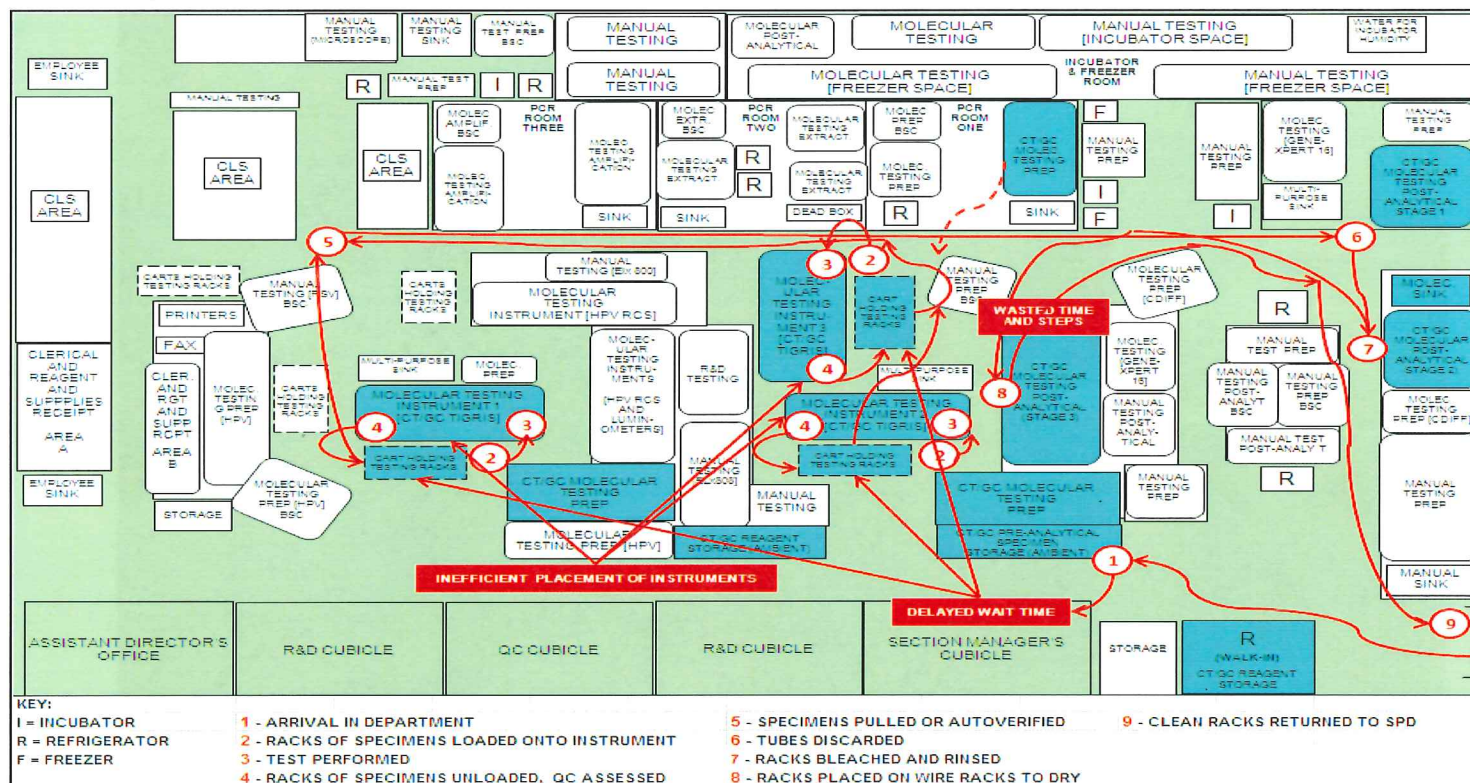
**LEAN OBSERVATION: (Mura)** Uneven arrival time contribute to sub-optimal pre-analytical wait time and result delay.

## Specimens Stored in Specimen Processing Department



**LEAN OBSERVATION:** Storage after log-in adds unnecessary pre-analytical wait time

# CT/GC Specimen Spaghetti Workflow Diagram in Virology



**LEAN OBSERVATION: Workflow pathway is not optimal**

Specimens are stored on shelves prior to testing



**LEAN OBSERVATION:** Storage adds unnecessary pre-analytical wait time

## Current State:



CLS prepares instrument, loads specimens, checks Quality Control for acceptability on completion of testing, pulls specimens for repeat testing, and merges and verifies results



(1) Post-analytical discarding of CT/GC specimens



## (2) Post-analytical bleaching and rinsing of CT/GC racks



## Current State:

(3) Drying of CT/GC racks, loading onto trays → SPD



**LEAN Observation:** Location of rack drying/tray prep area is not optimal



# Current State: Test Turnaround Time (TAT)



## Virology GenLab Module Test Turnaround Time (d:hh:mm) - 2014

- = Medical Center, Courier, or SPD delay
- = SWL Virology delay
- = Result delay

January	Total Count	Average Actual TAT Drawn to In Lab (= time allowed)	Average Actual TAT In Lab to Verified (= time allowed)	Average Actual TAT Drawn to Verified	Expected TAT Drawn to Verified
Chlamydia GC Swab Amplified Probe	15073	1:04:21 (0:12:00)	2:23:38 (3:12:00)	4:03:59	4:00:00 (96 hours)
Chlamydia GC Urine Amplified Probe	19880	1:04:20 (0:12:00)	2:23:30 (3:12:00)	4:03:50	4:00:00 (96 hours)
	34953				

February	Total Count	Average Actual TAT Drawn to In Lab (= time allowed)	Average Actual TAT In Lab to Verified (= time allowed)	Average Actual TAT Drawn to Verified	Expected TAT Drawn to Verified
Chlamydia GC Swab Amplified Probe	16057	1:19:43 (0:12:00)	3:10:00 (3:12:00)	5:05:43	4:00:00 (96 hours)
Chlamydia GC Urine Amplified Probe	19326	1:22:42 (0:12:00)	3:06:41 (3:12:00)	5:05:23	4:00:00 (96 hours)
	35383				

March	Total Count	Average Actual TAT Drawn to In Lab (= time allowed)	Average Actual TAT In Lab to Verified (= time allowed)	Average Actual TAT Drawn to Verified	Expected TAT Drawn to Verified
Chlamydia GC Swab Amplified Probe	16325	1:12:13 (0:12:00)	2:10:18 (3:12:00)	3:22:31	4:00:00 (96 hours)
Chlamydia GC Urine Amplified Probe	21936	1:17:18 (0:12:00)	2:11:30 (3:12:00)	3:28:48	4:00:00 (96 hours)
	38261				

**LEAN OBSERVATION: Drawn (Collected) to In Lab Times are excessive**

## Current State: (Part 1: Pre-analytical)

- **Non Value Added Time (NVAT)** = Storage of specimens on shelves prior to testing
  - Specimen Processors move the trays of specimen racks from a cart to the shelves.
  - CLSs move trays of specimens from the shelves to a cart to load the instruments.
- **LEAN OPPORTUNITY:** Directly deliver racks to a location in front of each instrument.



## Analysis of Opportunities for Improvement – Current State: (Part 2: Testing)



### Expedite workflow:

- Utilize all three instruments daily
- Assign a CLS to each instrument at 5 a.m.
- Station PCs near the instruments
- Change rotation to assign a CLS to the weekend staffing

### These changes would:

- Eliminate the initial delay in loading
- Expedite completion of testing and reporting
- Allow verification of results for all 2,000 same day versus the next day or later
- Enable CT/GC testing 7 days/week, with no added FTEs
- Allow room for growth

## Analysis of Opportunities for Improvement –

### Current State: (Part 3: Post-analytical)

- **Non Value Added Time (NVAT)** = Current location of the rack drying/tray preparation area is not optimal.
  - Unnecessarily moving the cleaned specimen racks to a bench top.

**LEAN OPPORTUNITY:** Move rack drying/tray preparation area to a bench top area next to the rack washing sink for return to the SPD.



Drying of CT/GC racks, loading onto trays → SPD



**LEAN OBSERVATION:** Location of rack drying/tray prep area is optimal

### Currently not used but will be implemented in Future State

- **6s:** sort, safe, straighten, scrub, standardize, sustain
- **Kanban:** smaller batch sizes
- **Better Layout:** spaghetti diagram
- **Andon Light:** audible error alarm
- **Visual Controls:** flashing alarm



# Summary of Current State Gemba Findings



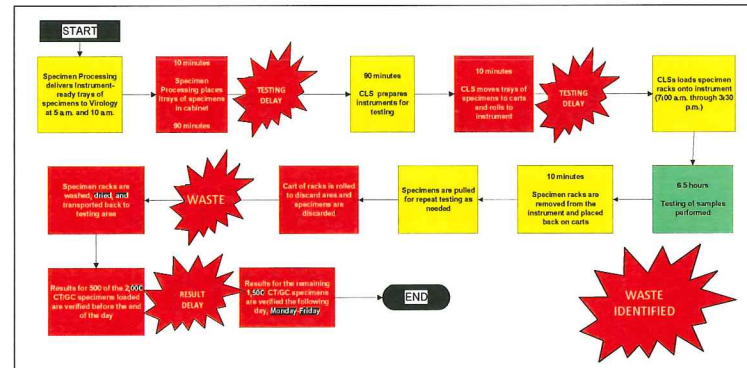
- Inefficient pre-analytical workflow
- Inefficient use of CLS staff
- Excessive NVAT wasted steps
- Inefficient post-analytical workflow

## Summary of Lean Improvements Future State:

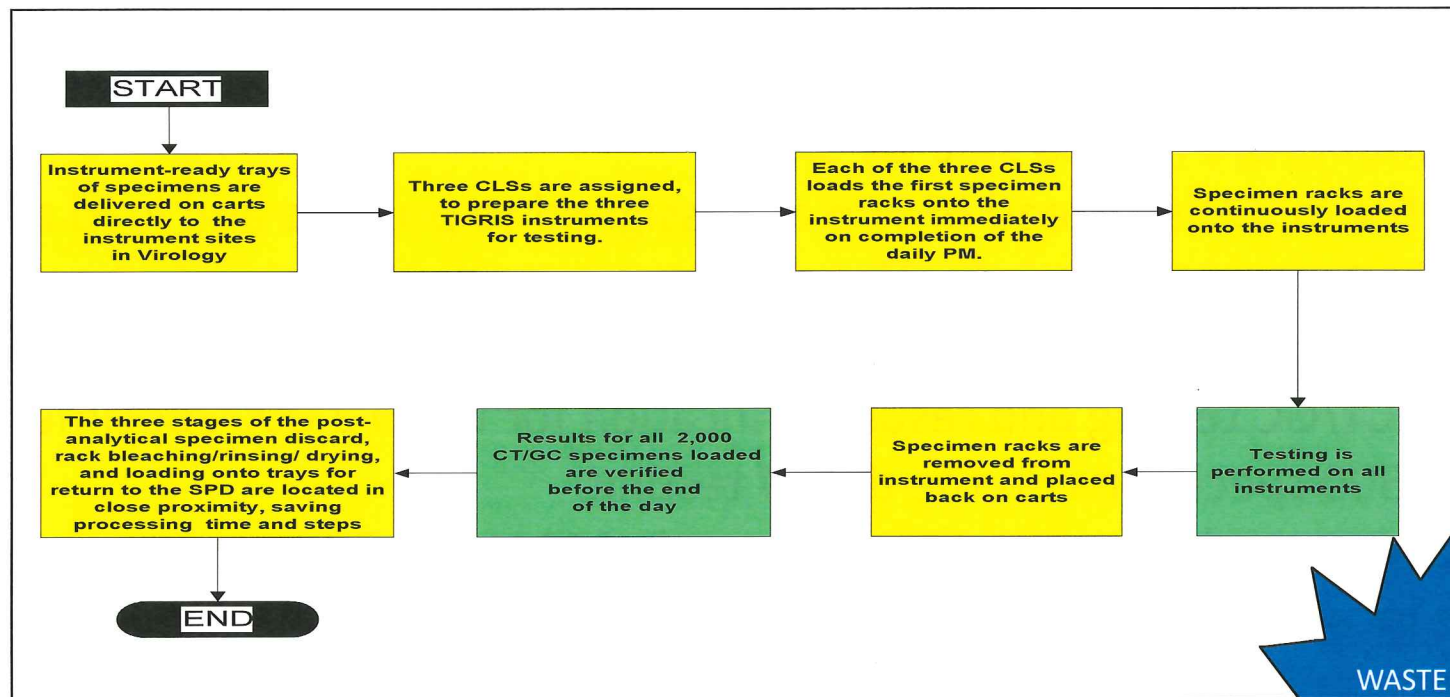


- Pre-analytical: Deliver trays of instrument-ready racks directly to each instrument area and eliminate the cabinet storage
- Instruments are moved side-by-side
- Three 5 a.m. CLSs instead of two are assigned to prepare and load all three instruments concurrently
- Smaller batch sizes with increased delivery of samples
- Enable CT/GC testing and result verification for up to 2,000 specimens verses 500 specimens on the day of testing.
- Implement testing on weekends instead of Monday-Friday.
- Move location of the post-analytical rack bleaching/tray preparation process.

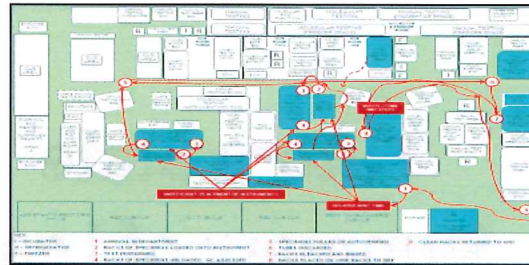




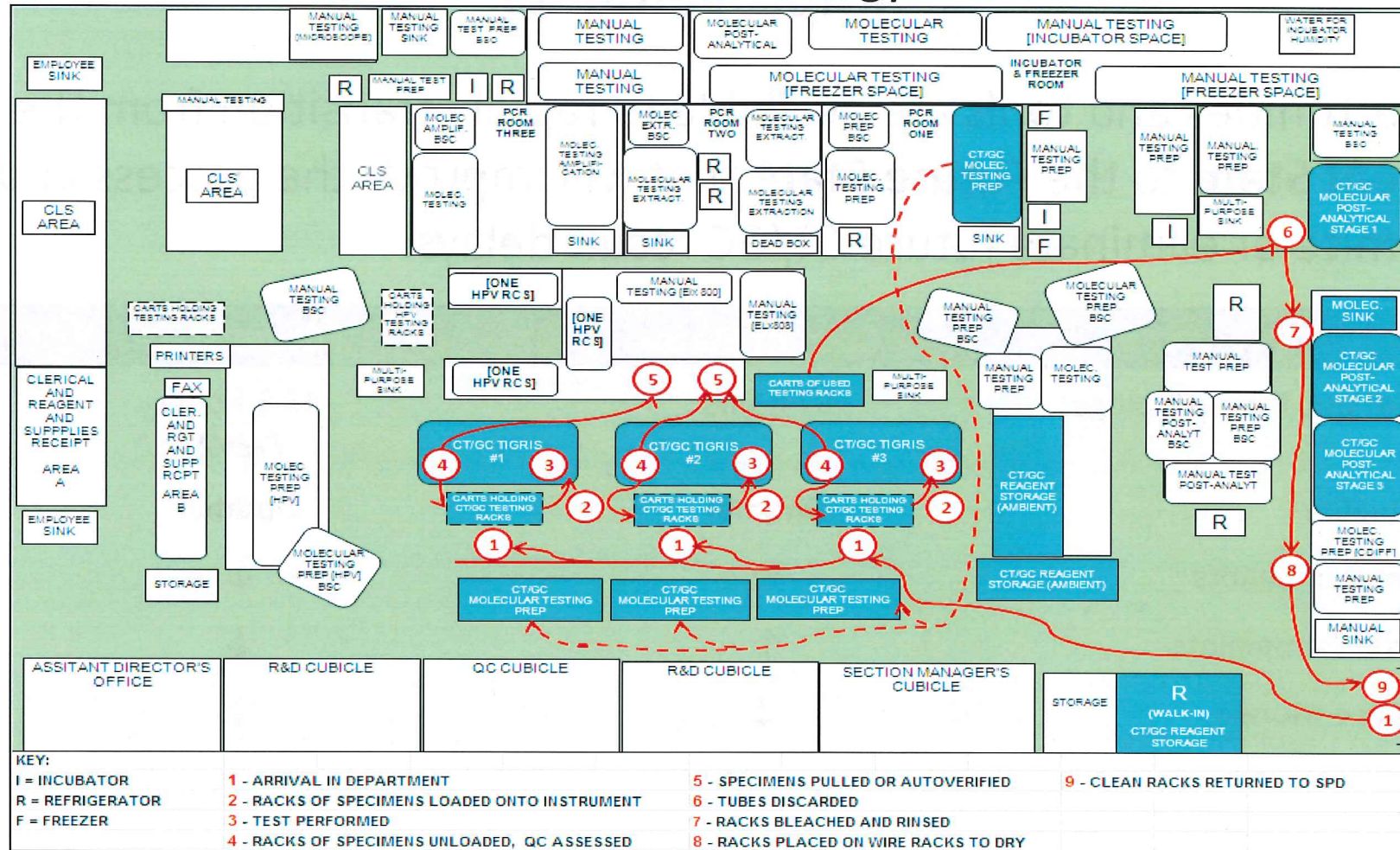
## Workflow Improvements from Current to Future State



**FUTURE**



## Future State: CT/GC Workflow in Virology



## Future State Summary of Lean Improvements



Opportunities and tools are available to rapidly transition from the **Current State** to the **Future State** that will improve the process and minimize or eliminate future CT/GC result delays.

	Current State	Future State
Throughput Time (Virology)	57 hours	13.5 hours (76%)
Test Quality	Optimal	Optimal
Patient Complaints	↑	↓
Provider Complaints	↑	↓
Employee Morale	↓	↑

### CT/GC Lean Improvement

- Auto-verification and Auto-release (utilize DI software)
- Streamlined pre-analytical process (SPD): Robot delivery
- Post-analytical (EVS and Acquiring of more sample racks)
- 24-hour a day Testing
  - Minimize test delays
  - Implement single piece flow real time processing to increase throughput
  - In-source molecular tests currently performed at Quest as outside lab tests with no additional staff needed

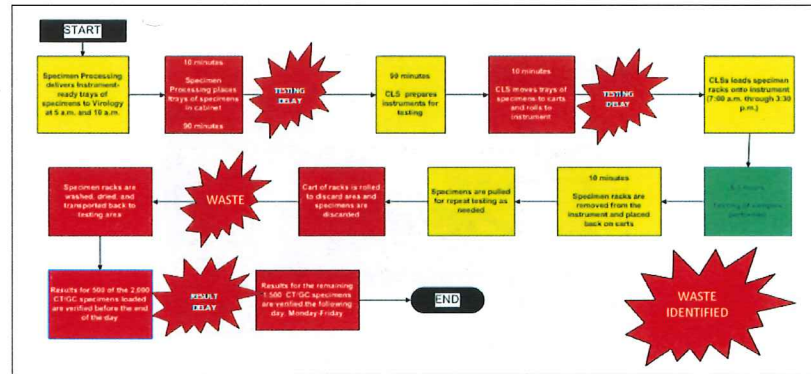
## In-Source Testing Capability



The following tests are currently sent out to Quest Diagnostics, Inc. :

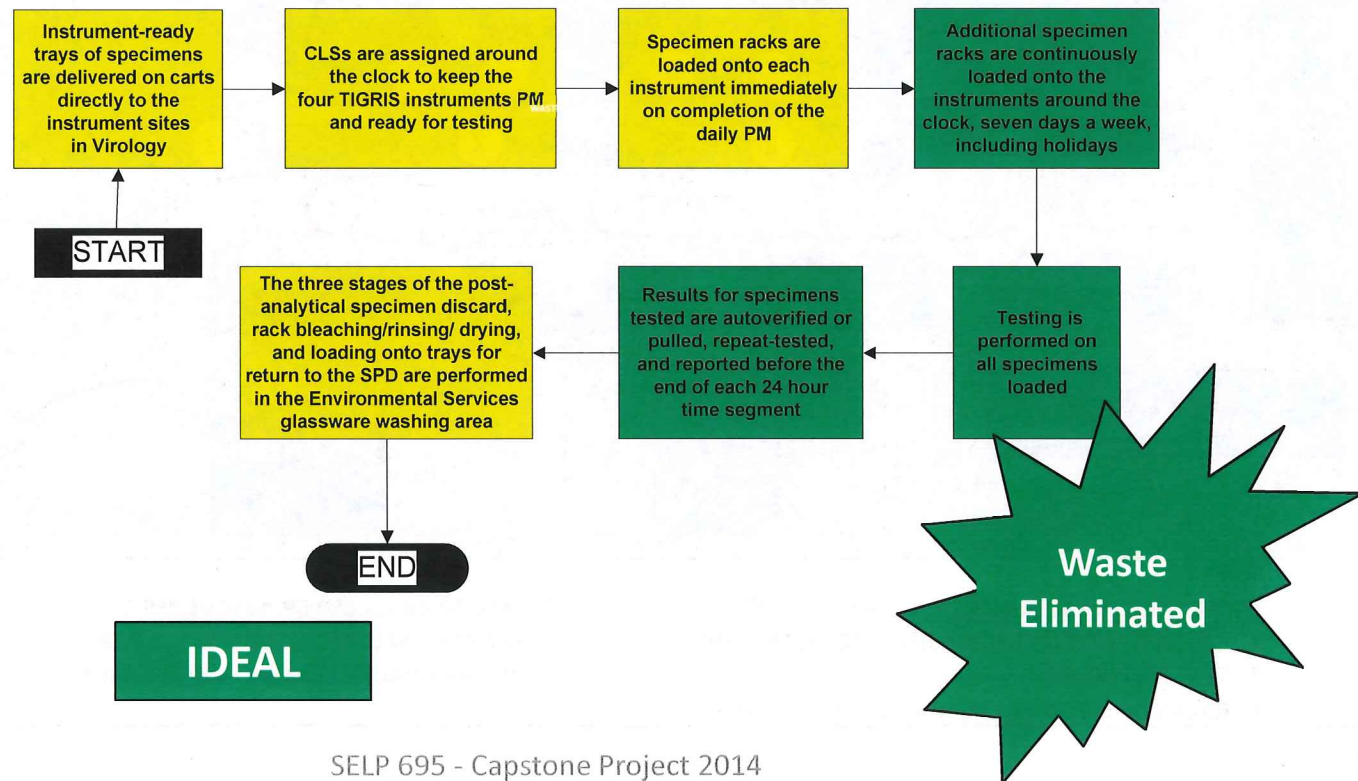
- QuantiFERON TB Gold: 8,663 per year = \$519,768 sendout savings
- Cytomegalovirus PCR: 3,126 per year = \$250,080 sendout savings

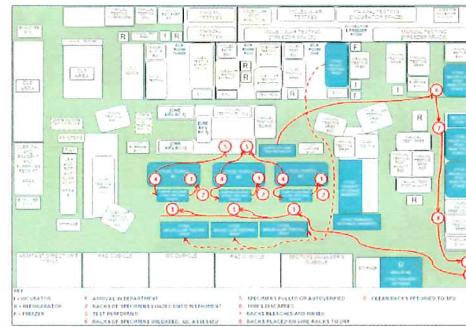
The tests can be internalized with no additional staff ; will have reagent cost.



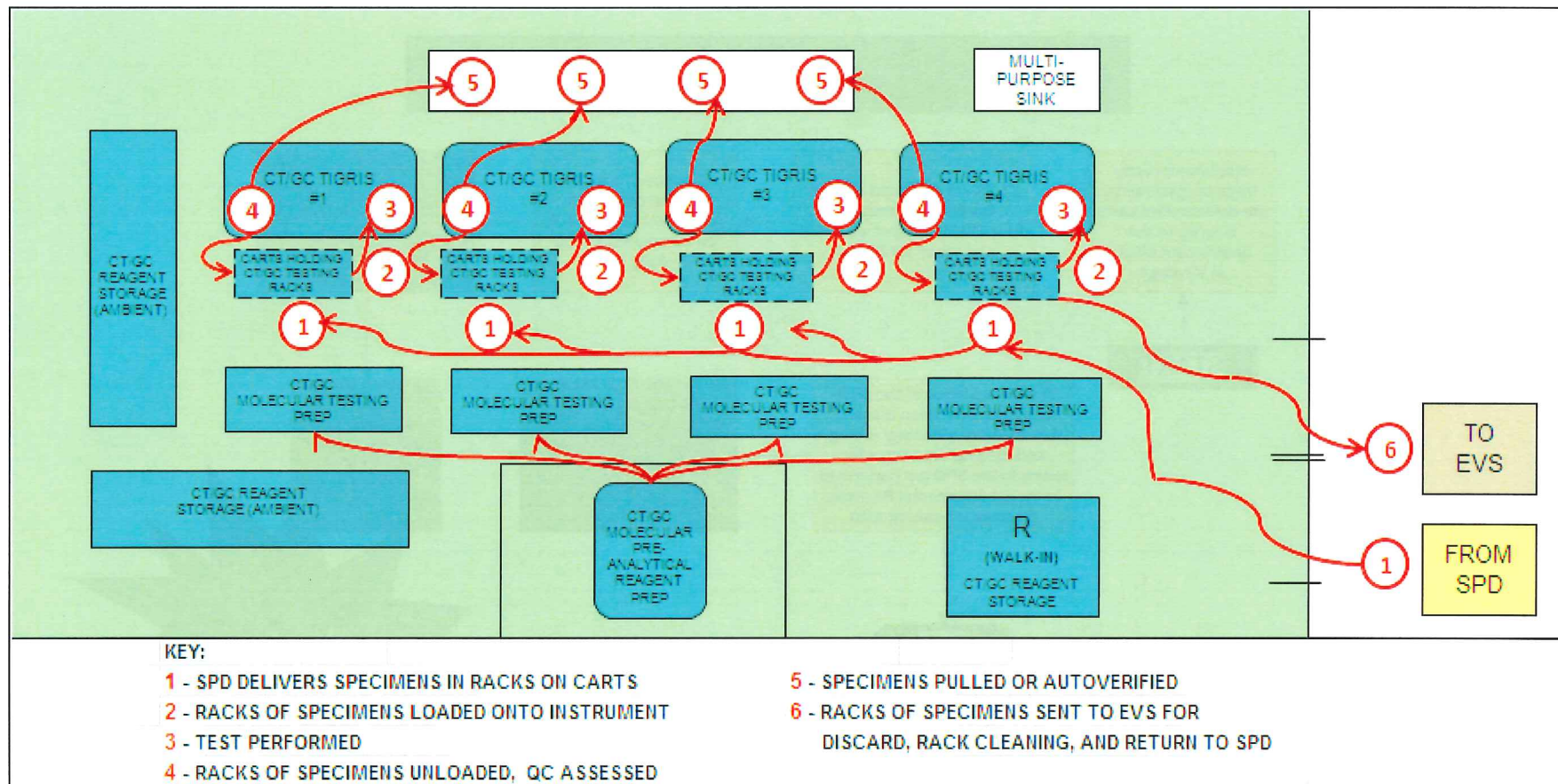
## Ideal State: SWL Virology Summary of Workflow Improvements

**24 Hours Around the Clock CT/GC Specimen Delivery, Loading, Testing, and Reporting via Autoverification**





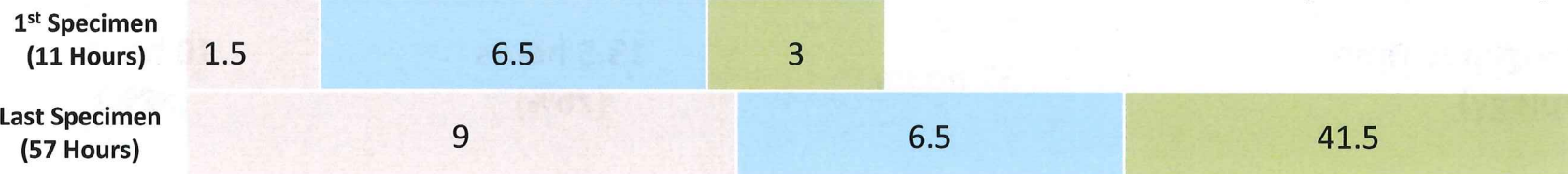
## Ideal State: CT/GC Workflow in Molecular Department (Annex)



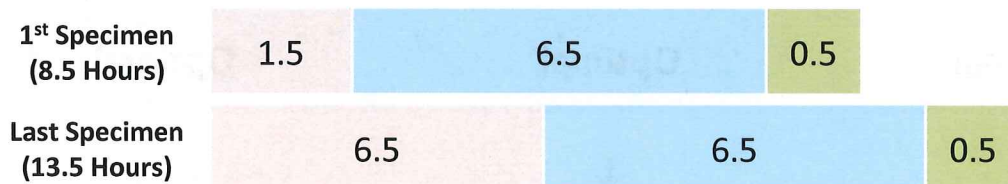
## Time Value Charts: Current, Future, and Ideal States

Key (Hours)	Virology Receipt to Loading	Loading to Test Completion	Test Completion to Result Verification
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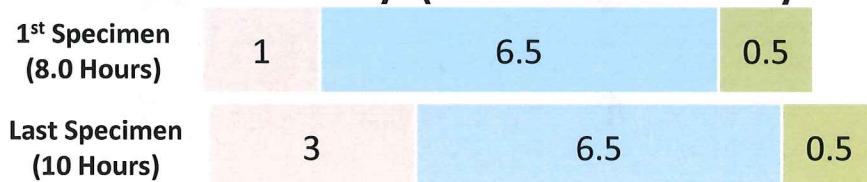
### Current State: Monday – Friday Only (maximum: 2000 specimens)



### Future State: Daily (maximum: 2,000 specimens)



### Ideal State: Daily (24-hour-a-day testing, minimum: 4,000 specimens)





## Summary: Current State, Future State, Ideal State

	Current State	Future State	Ideal State
<b>Throughput Time (Virology)</b>	57 hours	13.5 hours (76%)	10 hours (82%)
<b>Direct Cost Savings</b>	\$ 0	\$ 0	\$ 769,848
<b>Test Quality</b>	Optimal	Optimal	Optimal
<b>Patient Complaints</b>	↑	↓	↓↓
<b>Provider Complaints</b>	↑	↓	↓↓
<b>Employee Morale</b>	↓	↑	↑↑

## Respect for People



- The Lean approach is congruent with Kaiser Permanente's mission which emphasizes that everyone plays an integral role in a successfully functioning process
  - How we relate to one another
  - How we work with one another
  - How we define success
- To provide reliable, accurate, timely, meaningful, and cost-effective clinical laboratory services, for the benefit of the patient
- Understanding role of being a part of the team and finding fulfillment in our work; no more silos; empowered





Knowledge is Power (when you know better you do better)

- Mindset (Interconnectiveness in our interdependent system)
  - Great to Greater
  - Become Ambassadors to educate staff and leadership team
- Tools and Support
- Coordinate efforts
  - Change dynamics of how we work together to enhance efficiencies
  - Increased level of service will strengthen KP enterprise
- Next Steps (take action: educate and implement)
- Recommendations and acknowledgements

