The Future-Ready laboratory – Innovating beyond today's challenges with Total Laboratory Automation

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Classification of Lab Automation

No single definition but according to the complexity of instruments integration:

- **Analytical Automation** - all analyzers existing as stand-alone machines,

- **Partial Laboratory Automation** - "automation islets", where laboratory analyzers are interconnected and partially integrated with preanalytical workstations such as in the serum work area, integrating clinical chemistry and immunochemistry testing,

- **Total Laboratory Automation (TLA) -** where most analyzers performing different types of tests (i.e. clinical chemistry, immunochemistry, hematology, hemostasis and so forth) on different sample matrices (e.g. whole blood, serum, heparinized or citrated plasma) are physically integrated as modular systems or connected by assembly lines (e.g. tracks, belts and other types of conveyers).

Why Automation & Digital Solution ?

Objectives to Consider for Technology Gain Automation

Central Reference Laboratory

Extend Clinical Capabilities

How can I advance the clinical capabilities of my institution to foster innovative concepts of patient care?

Improve Quality of Care

How can I focus my entire operation to improve the outcome for patients?

Standardize

How can I standardize the quality of care provided throughout my institution and across my network?

Attract, Retain, Develop Workforce

How can I manage my operations more efficiently to better leverage my workforce?

Increase Efficiency

How can I manage my processes more efficiently?

Reduce Risk & Liability

How can I better manage my operations to limit the risk of liability?

Burden of Over Head Cost

How can I better manage my operations to reduce my overhead burden?

Improve Profitability

How can I ensure that my organization is financially sustainable?

Stay Competitive

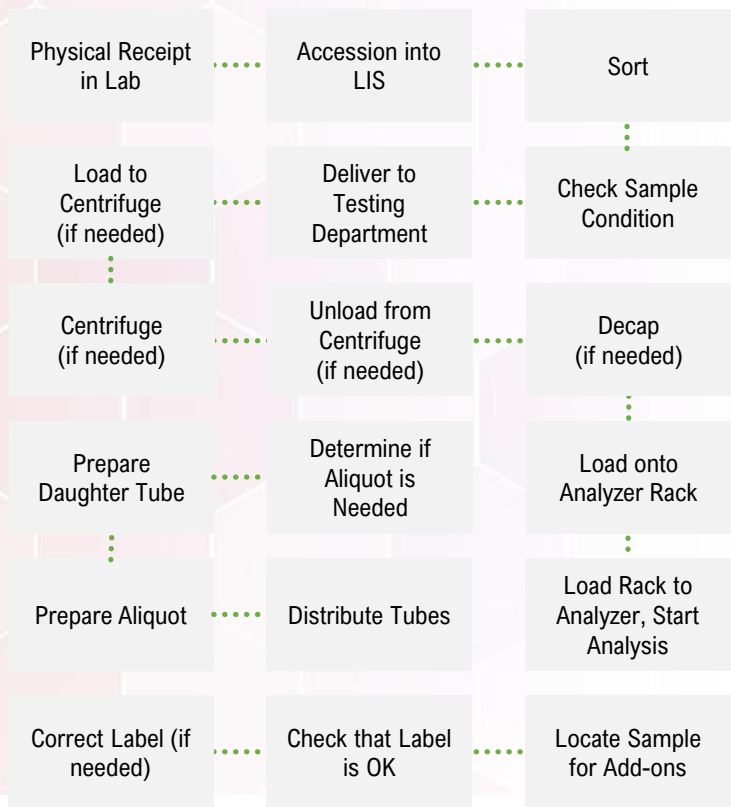How can I ensure that my operations remain competitive in the long run?

Manage Reputation

How can I ensure that the reputation of my institution positively impacts my business results?

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Manual Workflow | The Standard Workflow

Pre-analytical

Physical Receipt in Lab	Accession into LIS	Sort
Load to Centrifuge (if needed)	Deliver to Testing Department	Check Sample Condition
Centrifuge (if needed)	Unload from Centrifuge (if needed)	Decap (if needed)
Prepare Daughter Tube	Determine if Aliquot is Needed	Load onto Analyzer Rack
Prepare Aliquot	Distribute Tubes	Load Rack to Analyzer, Start Analysis
Correct Label (if needed)	Check that Label is OK	Locate Sample for Add-ons

Analytical

Analysis

Post-analytical

Conduct Results Review	Determine if Reflex/Rerun is Needed	Locate Sample for Reflex Testing
Load to 2nd Analyzer Rack	Match Order to Sample	Unload from Archive Rack
Enter Order at Analyzer (if needed)	Unload Rack from Analyzer	Return to Bench
Recap Tube, Move to Storage	Load to Archive Rack	Determine Where Tube Will be Stored
Dispose of Sample		

Labor Hours Spent in Phase

18 steps	60%

	30%

13 Steps	10%

Potential Risks Along The Sample Processing Continuum

Central Reference Laboratory

Pre-analytical

Physical Receipt in Lab	Accession into LIS	Sort
Load to Centrifuge (if needed)	Deliver to Testing Department	Check Sample Condition
Centrifuge (if needed)	Unload from Centrifuge (if needed)	Decap (if needed)
Prepare Daughter Tube	Determine if Aliquot is Needed	Load onto Analyzer Rack
Prepare Aliquot	Distribute Tubes	Load Rack to Analyzer for Test Analysis
Correct Label (if needed)	Check that Label is OK	Locate Sample for Aliquots

Analytical

Analysis

⚠️ The more techs **handle tubes, the greater their risk**

Post-analytical

Compare Results Review	Determine if Reflex/Rerun is Needed	Locate Sample for Reflex Testing
Load to 2nd Analyzer Rack	Match Order to Sample	Unload from Archive Rack
Enter Order at Analyzer (if needed)	Unload Rack from Analyzer	Return to Bench
Recap Tube, Move to Storage	Load to Archive Rack	Determine Where Tube Will be Stored
Dispose of Sample		

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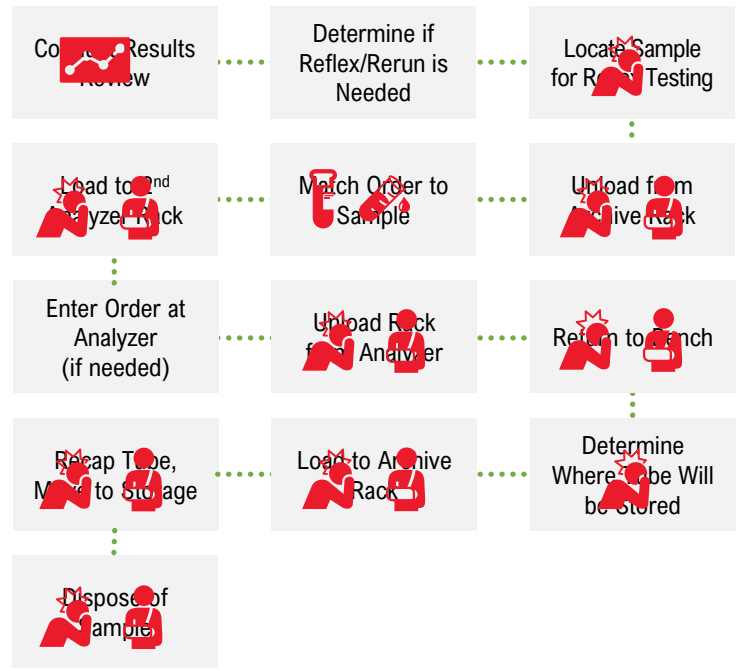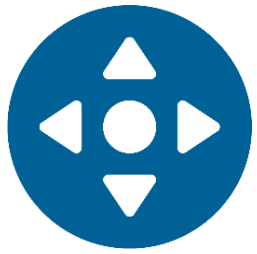
Preparing your lab for automation

Preparing Your Lab For Automation

Do you have a standardized process?

Having the process standardized and documented in detail is CRITICAL to successful automation

How frequently does lab process change?

Knowing the areas where frequent changes would occur needs a system with the flexibility to support the process

How much of the laboratory process needs to be automated?

The enthusiasm to automate processes can lead to over engineering

Automation of some specialty area's can make process more cumbersome

✓ **Standardized lab process**

✓ **Giving a flexibility of future lab growth**

✓ **Simplify work within your control**

IF YOU Automate JUNK, YOU GET AUTOMATED JUNK

- The first rule of any technology used in a business, is that automation applied to an efficient operation **will magnify the efficiency**.

- The second, is that automation applied to an inefficient operation **will magnify the inefficiency.**

- Bill Gates
  Founder of Microsoft Corporation

Step By Step : Leverage Technology To Eliminate Bottleneck-Journey of Continuous Improvement

01 CRAWL
- Manual Operation
- Standalone Analyzer
- Labour Intensive

Preanalytical Workstation Manual

Clinical Chemistry Analyzer

Immunoassay Analyzer

Hematology Analyzer

Hematology Analyzer

Storage Archive

Clinical Chemistry Analyzer

Immunoassay Analyzer

Hemostasis Analyzer

Allergy Analyzer
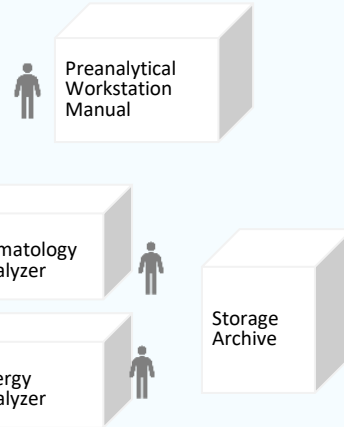
02 WALK
- Integrated IA CC Analyzer
- Introduction Lab IT

Preanalytical Workstation Manual

Integrated Chemistry Analyzer

Integrated Immunoassay Analyzer

Hematology Analyzer

Hematology Analyzer

Storage Archive

Integrated Chemistry Analyzer

Integrated Immunoassay Analyzer

Hemostasis Analyzer

Allergy Analyzer
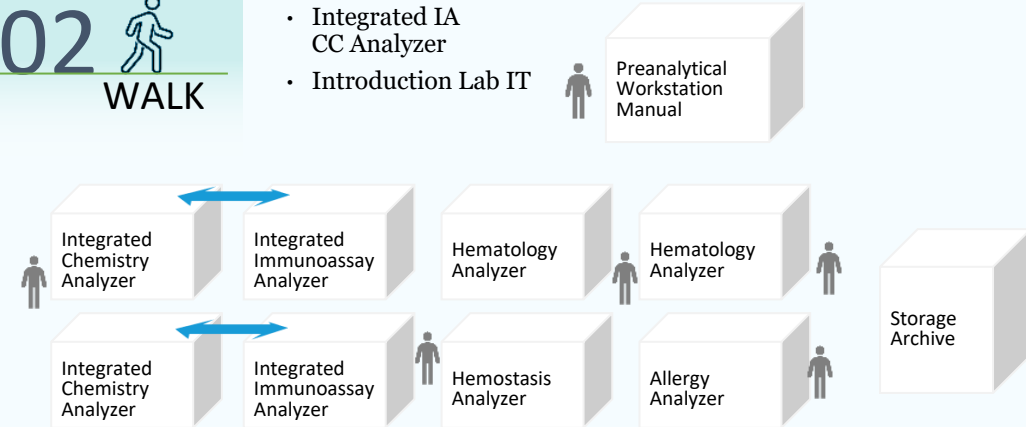
03 RUN
- Task Targeted Automation
- Focus on Bottleneck
- Automate - Manual Error Prone Steps
- Discipline Antagonistic
- Comprehensive IT with auto verification

Pre-analytical Task Targeted Automated

Clinical Chemistry Analyzer

Immunoassay Analyzer

Clinical Chemistry Analyzer

Immunoassay Analyzer

Post analytical Task Targeted Automated

Storage Archive

Pre and Post analytical Task Targeted Automated

Hematology Analyzer

Hemostasis Analyzer
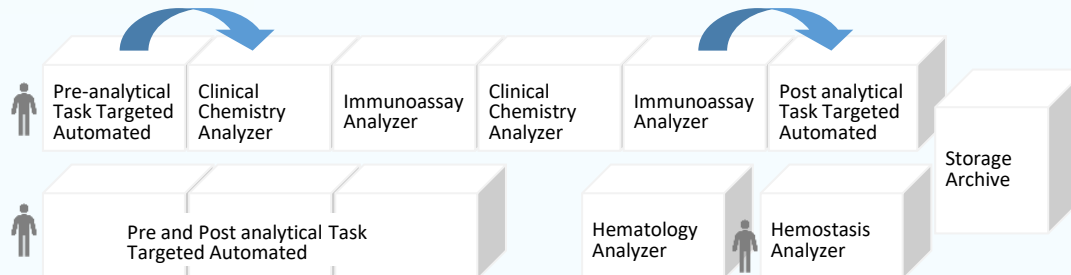
04 FLY
- E2E Total Lab Automation
- Multidisciplinary
- Comprehensive IT with auto verification

Pre-analytical Module Automated

Pre-analytical Module Automated

Spiral and Elevated Track

Clinical Chemistry Analyzer

Immunoassay Analyzer

Clinical Chemistry Analyzer

Post-analytical Module Automated

Online Archive

Spiral and Elevated Track

Clinical Chemistry Analyzer

Next Room or Another Floor Automation Islands

Spiral and Elevated Track

Clinical Chemistry Analyzer

THE APOLLO CRL STORY

Apollo Chennai - Digi-Smart Lab –
India Largest Zero Human Touch e2e Multidisciplinary Automation

Apollo Labs & Hospitals – Cluster Consolidation
All locations within a 50 min distance of Central Reference Lab

Hospital Name	Bed size	Distance from CRL Google Maps	Time in mins* @ Peak Google Maps
AHLL, Central Reference Lab (CRL)	NA	0	0
Flagship Apollo Hospital (AH), Main Apollo Heart Centre Apollo Women's Hospital Apollo Women & Children's Hospital	736	1	5-10 mins
AH, Tondiarpet	60	12	40 mins
Apollo Cancer, Teynampet	300	4.5	15 mins
Apollo Speciality, OMR	118	14.1	37 mins
Apollo Speciality, Vanagram	300	14.6	50 mins
Apollo Proton, Tharamani	150	12.6	31 mins
Apollo First Med, Kilpauk	80	4.2	11mins
Kotturpuram (New)	NA	6.8	18 mins
Outside Chennai (Madurai, Karur, Nellore, Trichy) Specialized tests	NA	NA	NA

1. **Apollo Hospital, Main**
2. **Apollo Heart Center**
3. **Apollo Women & Children Hospital**
4. **Chennai - Children Hospital**
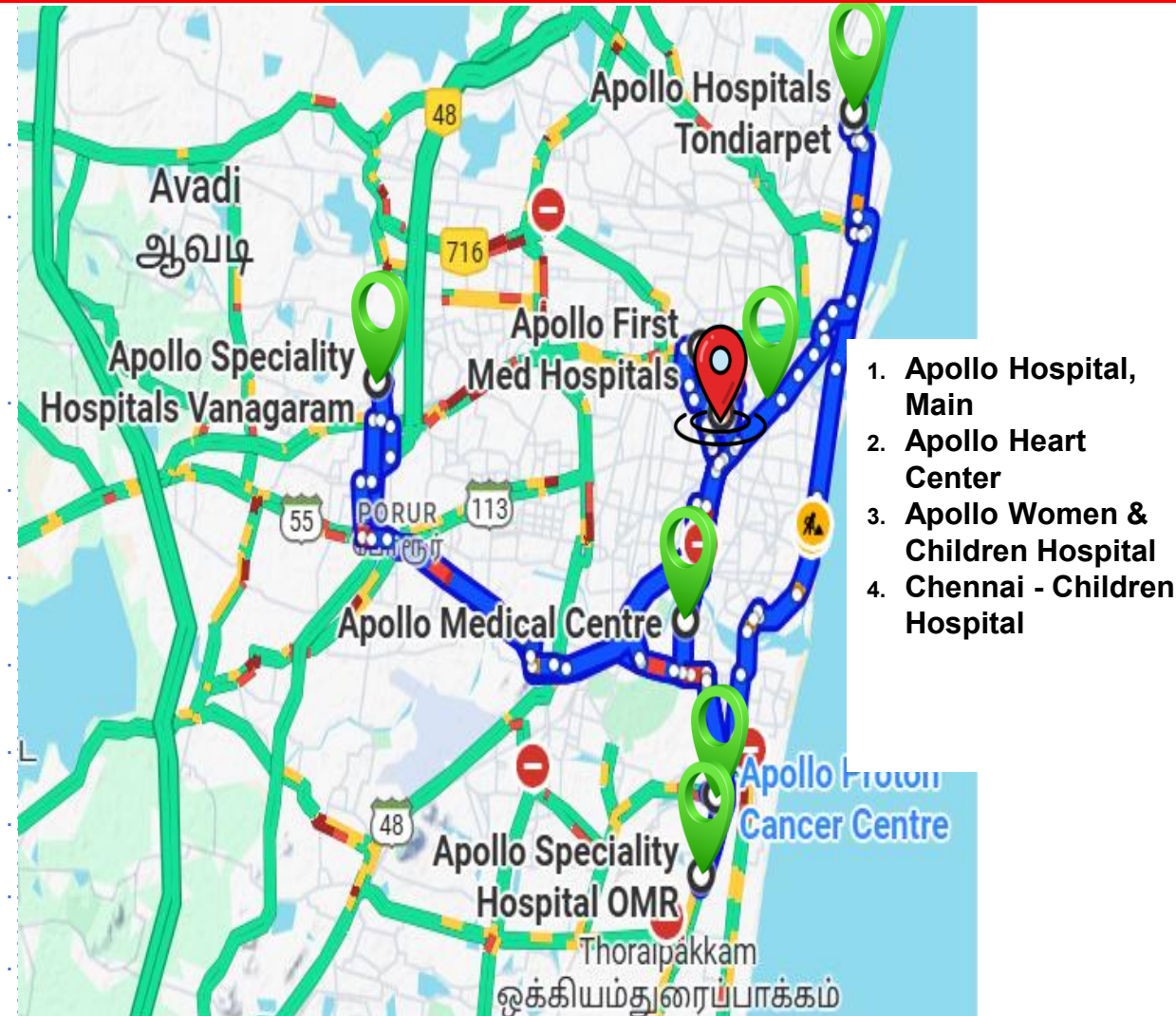
APOLLO : Informatics
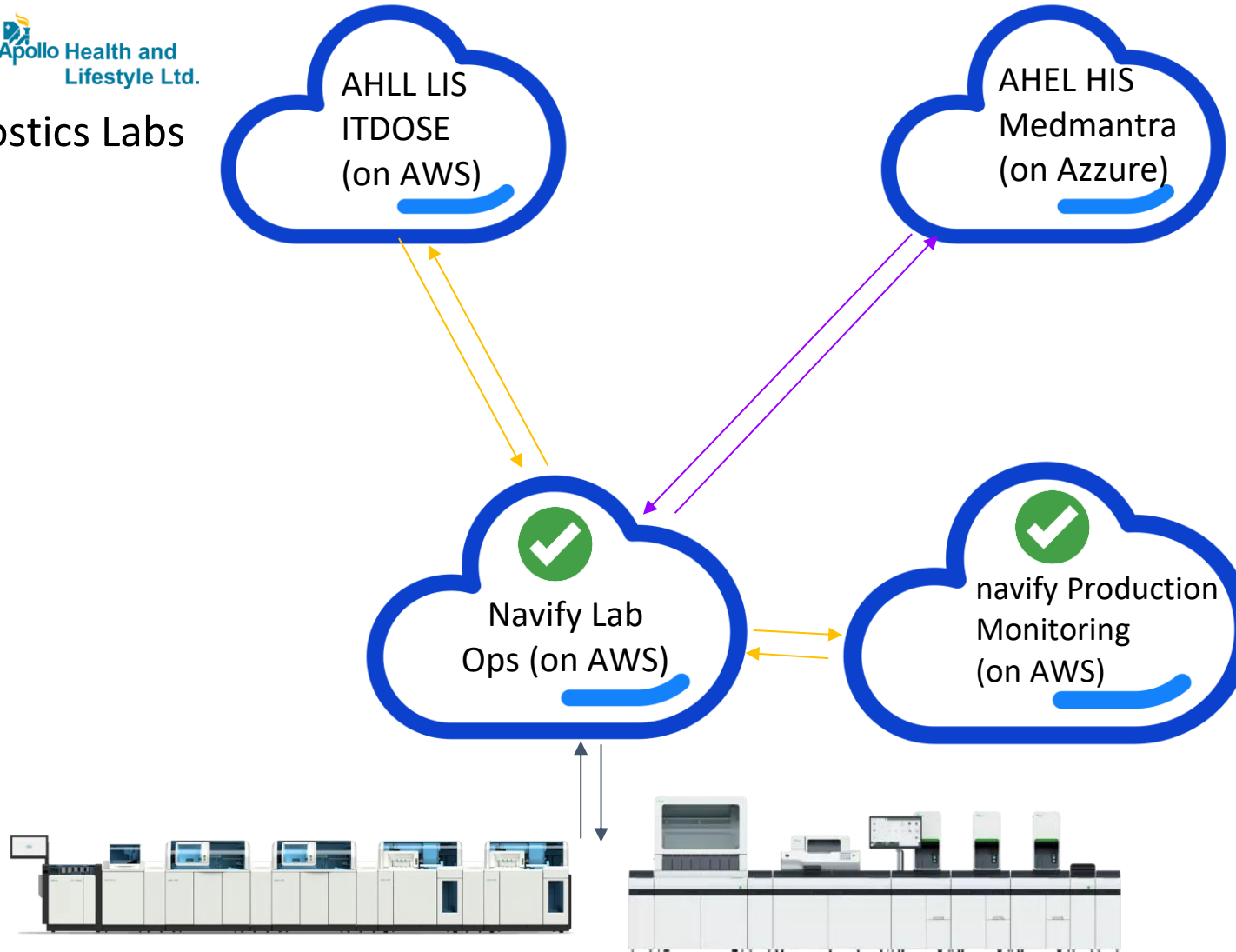
Before & After Digi Smart Lab: Workload Comparison

Biochemistry Sample Tubes (Oct 24 vs 25) — Oct 24: 6250, Oct 25: 8215, 31%
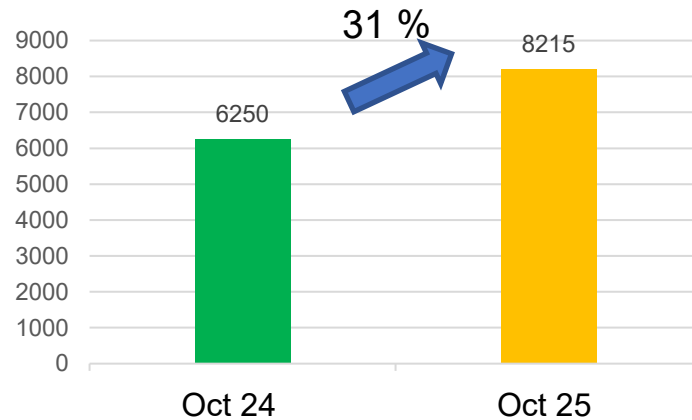
Clinical Chemistry Test (Oct 24 vs 25) — Oct 24: 18500, Oct 25: 22500, 21%
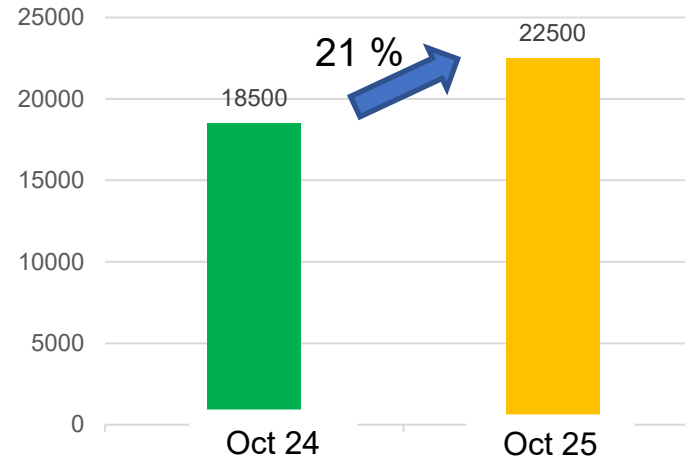
Immunoassay & Serology Test (Oct 24 vs 25) — Oct 24: 2014, Oct 25: 2759, 36%
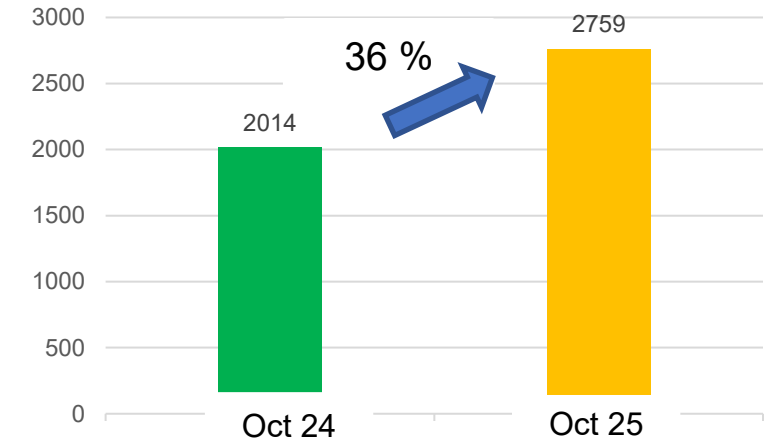
Hematology Sample Tubes (Oct 24 vs 25) — Oct 24: 2016, Oct 25: 2720, 34%

CBC (Oct 24 vs 25) — Oct 24: 1750, Oct 25: 2456, 40%

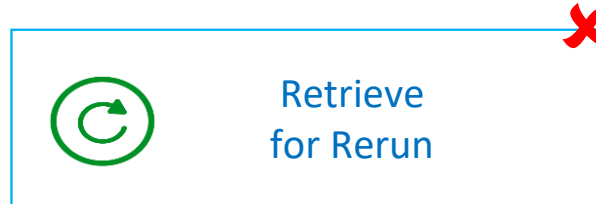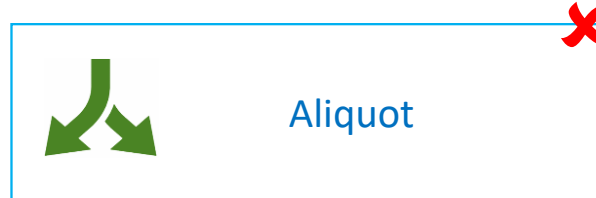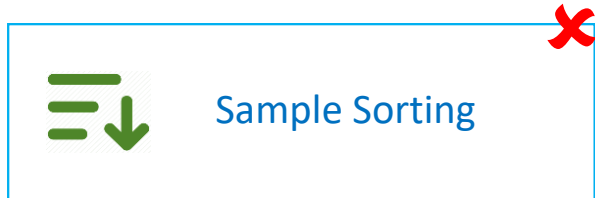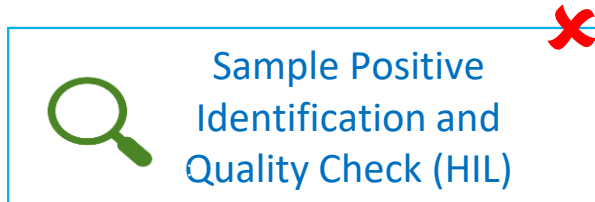**ESR (Oct 24 VS 25)** — Oct 24: 452, Oct 25: 560, 23%
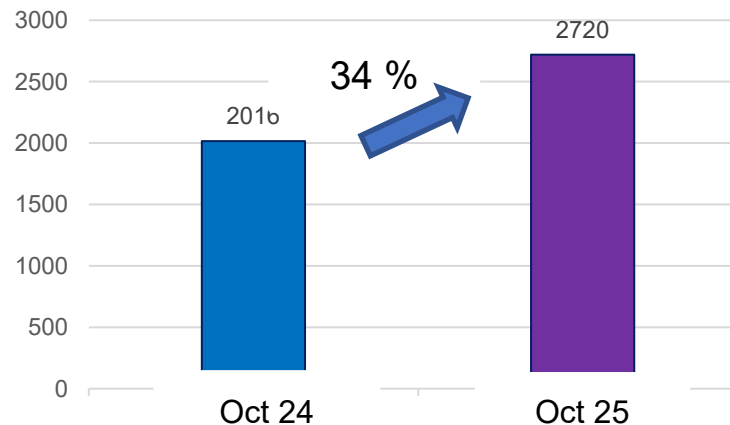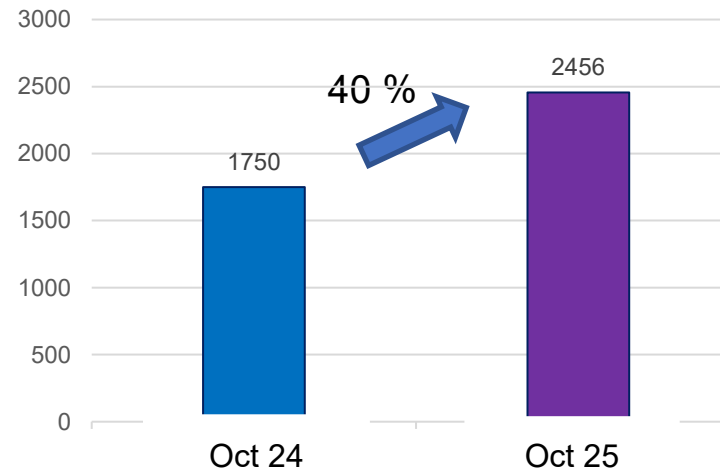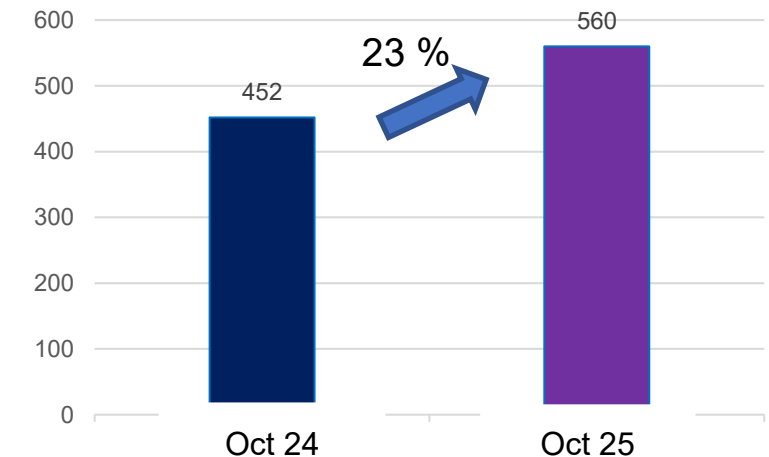
Before & After Roche Automation: Improvement TAT in mins (Analytical TAT)

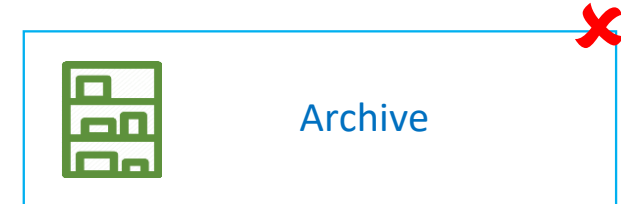Analytic TAT : From Specimen Recd to Preliminary Validation – All within the 90 min target

Biochemistry Overall –
90%centiile TAT

Improved
46%

Clinical Chemsitry -
90 %centile TAT

Improved
45%

Immunoassay -
90 % centileTAT

Improved
42%

Hematology Overall -
90%centile TAT

Improved
40%

CBC –
90 %centile TAT

Improved
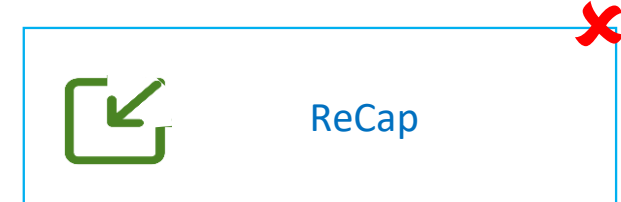50%

ESR 90%centile TAT

Improved
25%
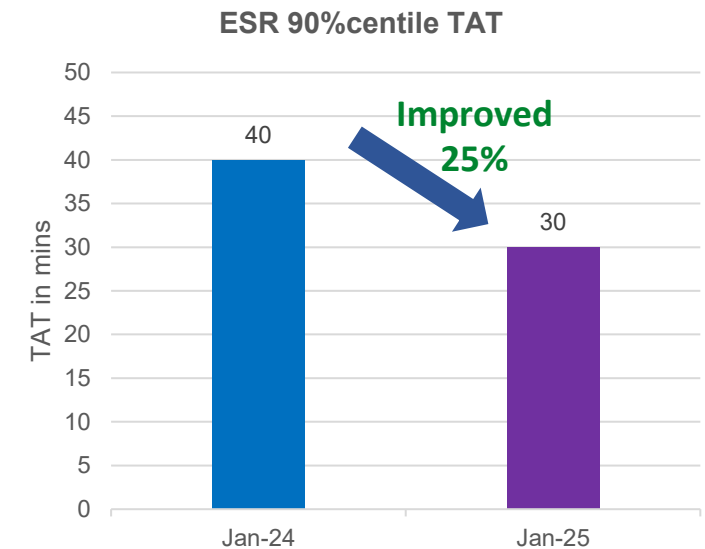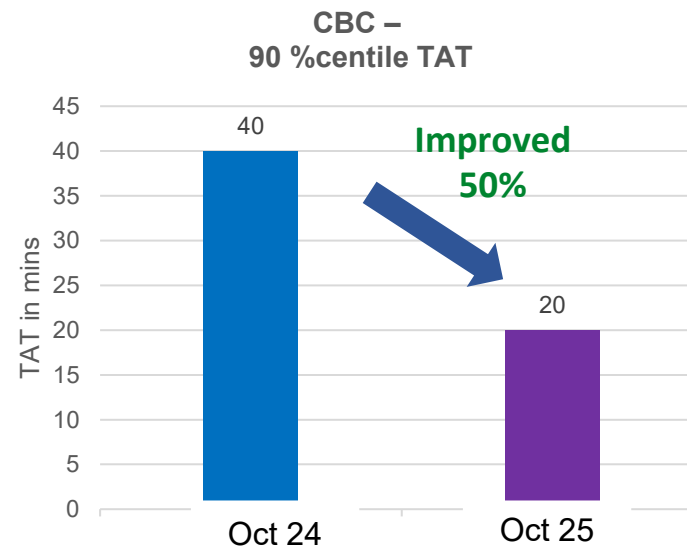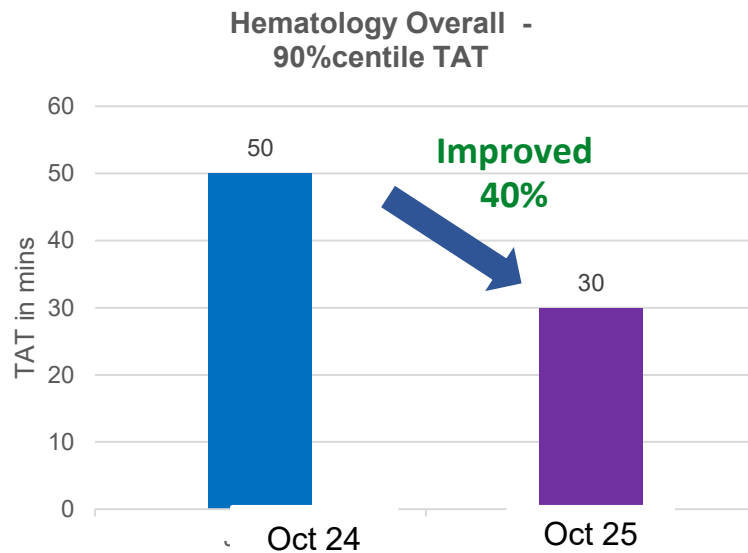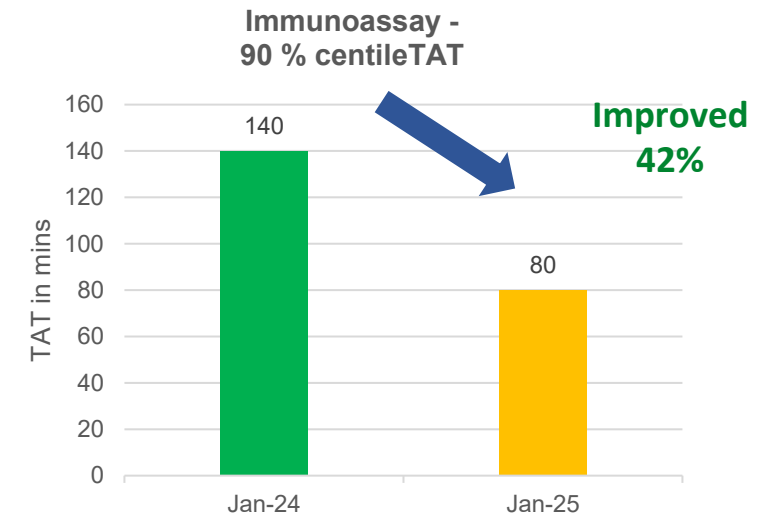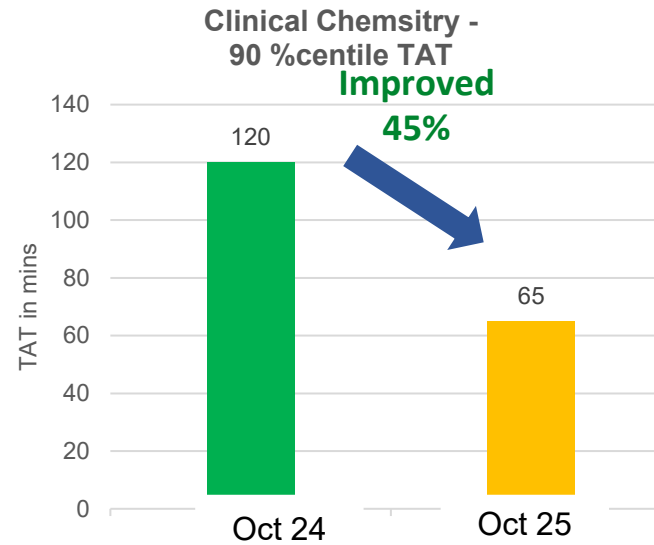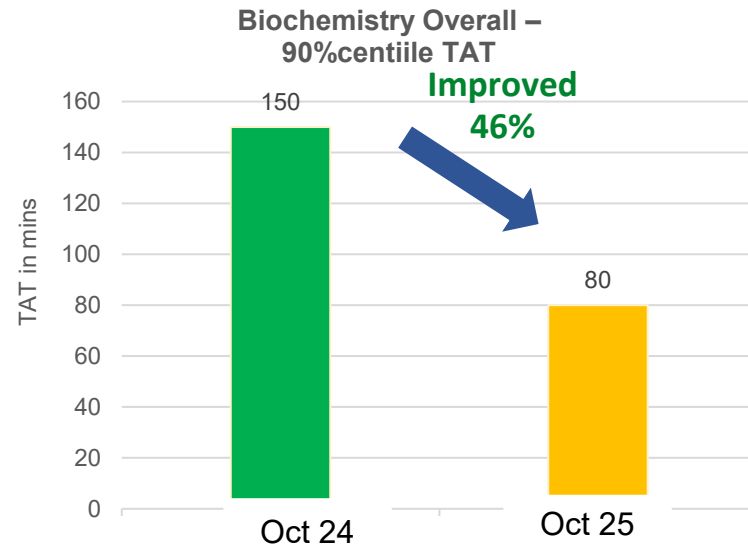
Steps & Potential Errors Eliminated with Digi Smart Automation

6 Main and 14 sub Pre-Analytics Steps

3 Main and 12 sub Post-Analytics Steps

Sample Positive Identification and Quality Check (HIL) ✖

Decap ✖

ReCap ✖

Sample Sorting ✖

Aliquot ✖

Preliminary Validation ✖

Centrifuge ✖

Retrieve for Rerun ✖

Archive ✖

- **9 main steps and 26 Sub steps eliminated** with Roche automation and navify ® Lab ops

- A total of **52** associated **potential errors eliminated**

Success story to continue with many more milestones like
- ✓ **Cost efficiency,**
- ✓ **Staff satisfaction,**
- ✓ **Risk reductio,**
- ✓ **Zero error,**
- ✓ **Competition leverage….**

Vision

Doing now what patients need next

Our Zero Touch e2e
Multidisciplinary Automation & Digital Solution ,CRL, Chennai

Thank You!