MORAVSKOSLEZSKÁ NEMOCNICE HAVÍŘOV

Lékařská fakulta Univerzity Palackého v Olomouci

NATFORLAB 2026

Future of Laboratory Medicine

From Fragmentation to a Compact Laboratory Solution

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AGENDA

What We'll Cover in 35 Minutes

1. **Why laboratories are changing**
   Pressure points of the traditional, fragmented model
2. **Total Laboratory Automation**
   Definition, architecture, and the evidence for its benefits
3. **Beyond the track**
   Value-based medicine, hyperautomation, cobots & mobile robots
4. **Case study: Moravian-Silesian Hospital Havířov, CZ**
   A real transformation from fragmentation to a compact SNIBE SATLARS T8 line
5. **Lessons & path forward**
   Success factors, roadmap, and key takeaways

CONTEXT

Laboratories Are Under Mounting Pressure

113B+

USD global IVD market projected for 2026

50–70%

of detectable lab errors still originate preanalytically

30%+

estimated laboratory workforce shortfall by 2030

Laboratories are forced to rethink how they operate

- **Increasingly complex, high-volume testing menus; amplification of errors risk**
- **24/7 Service expectations of rapid, predictable turnaround times (TAT)**
- **Chronic shortages of qualified laboratory staff**
- **Growing need to demonstrate clinical value, not just volume**

Sources: Mukherjee et al., Diagnostics 2026;16:518. Gruson, Zima, Plebani, Clin Chem Lab Med 2026;64:1197–1200

THE PROBLEM

Challenges of the Traditional, Fragmented Laboratory

Manual, disconnected workflows strain space, time, quality and safety

1 Space

Inadequate physical layout; scattered instruments; limited room for growth

2 Turnaround Time

Manual routing and hand-offs delay results at every workflow stage

3 Results & Quality

Delayed detection of drift; manual QC creates inconsistent timing

4 Safety

Manual handling of biohazardous specimens; inconsistent protocol compliance

Pattern consistent across TLA literature; see Nam & Park, Ann Lab Med 2025;45:472–483 (Fig. 3).

DEFINITION

What Is *T*otal *L*aboratory *A*utomation?

i **DEFINITION**

TLA is the end-to-end automation of the pre-analytical, analytical, and post-analytical processes within a clinical laboratory — unified by tracks, robotics, and laboratory information systems.

Not just faster analyzers — a redesigned, connected workflow architecture.

1 **Pre-analytical**

Sample transport, reception, barcode ID, sorting, centrifugation, aliquoting

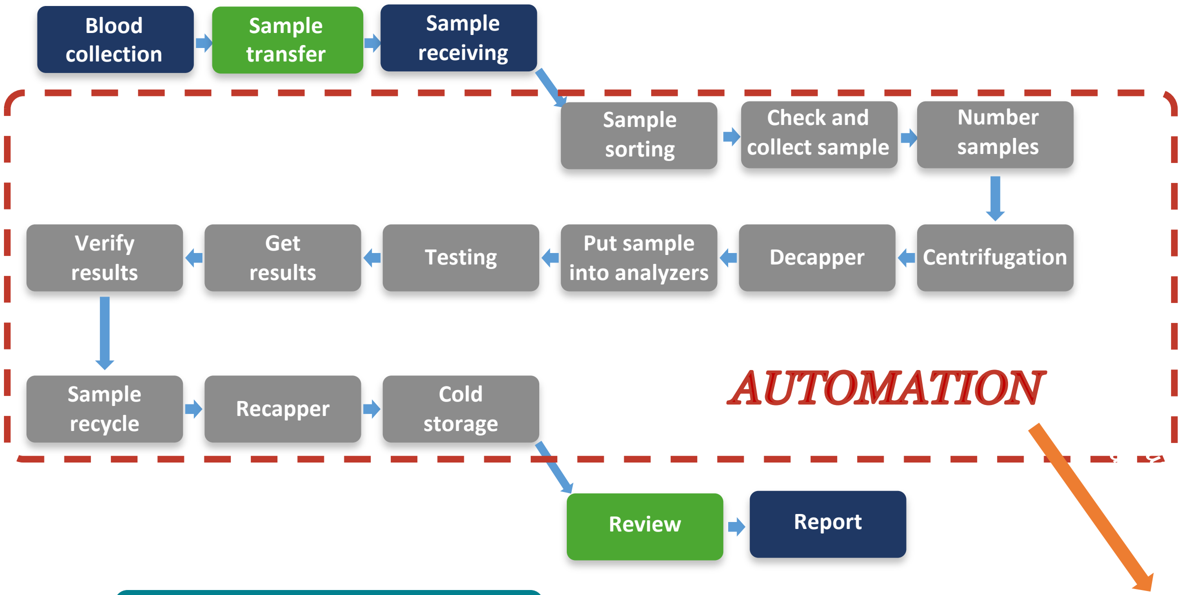
2 **Analytical**

Automated analyzers coordinated through middleware for seamless routing

3 **Post-analytical**

Automated result validation, EHR integration, sample archiving & retrieval

Nam Y, Park HD. "Pioneering Trends in Total Laboratory Automation." Ann Lab Med 2025;45:472–483.



Reduction

Manual labor 80%
Biohazard 80%
Error-prone 100%

80+ %
steps can be automated

ARCHITECTURE

An Integrated Physical Workflow

Pre-analytical Automation	Analytical Automation	Post-analytical Automation
• Seamless sample processing • Built-in QC • Smart sample sorting	• Intelligent routing • Load balancing • Real-time monitoring	• Auto-validation (delta checks, alerts, 95% auto) • Reflex testing • Smart cold storage

Three phases, one continuous, orchestrated flow — connected by automation tracks, robotics, middleware and the laboratory information system (LIS).

Adapted from Nam & Park, Ann Lab Med 2025;45:472–483.

WHY IT MATTERS

Expected Benefits of TLA Implementation

Increased Efficiency

Optimized space utilization, faster processing, prompt error alerts

Enhanced Accuracy & Consistency

Minimizes human error; fewer pre- and post-analytical mistakes

Improved Working Environment

Less labor-intensive work; staff refocus on complex, higher-value tasks

Faster, More Reliable TAT

Timely results improve patient and clinician satisfaction

Nam Y, Park HD. Ann Lab Med 2025;45:472–483 (Fig. 1).

THE EVIDENCE

Quantified Impact Across Health Systems

+42% test productivity per worker with TLA	**<120 min** TAT for 95% of TLA-based tests	**−86%** discrete processing steps in large-scale TLA
−45% laboratory footprint after implementation	**\$0.79→\$0.15** cost per test after decades of automation	**4–5 yr** typical payback period for TLA investment

Ann Lab Med 2025;45:472–483; Mukherjee et al., Diagnostics 2026;16:518 (Table 1; longitudinal NY academic-center data).

Global TLA Vendor Landscape

Vendor	Representative System	Sample Carrier	Connectivity
Abbott Diagnostics	GLP Systems Track / ACCELERATOR APS	Single carrier	Open
Beckman Coulter	DxA 5000 / Power Express	Single carrier, conveyor	Open
Roche Diagnostics	cobas 8100 / CCM	Rack, conveyor	Closed
Siemens Healthineers	Aptio Automation + Atellica	Single carrier (Puck)	Open
SNIBE	SATLARS T8	Single carrier	Open
Thermo Fisher Scientific	TCAutomation	Rack, conveyor	Open

The global TLA market was estimated at \$5.6–6.1B in 2023; Europe holds roughly 31% regional market share, with North America leading at ~38%.

Nam Y, Park HD. Ann Lab Med 2025;45:472–483 (Tables 1–2; market data, 2023–2024).

BEYOND EFFICIENCY

From Volume to Value: Automation as a Value Driver

Automation is a strategic enabler of value-based laboratory medicine, not just a technology upgrade

Redistributes skilled staff toward interpretation, consultation and quality leadership

Reduces required sample volumes — a real benefit for neonates & critically ill patients

Expands automation into molecular diagnostics and mass spectrometry

KEY PERFORMANCE INDICATORS

- Automation efficiency (% tests automated)
- Error rate reduction
- Sample throughput
- Turnaround time (TAT)
- Equipment utilization
- Specimen rejection rate

"Hyperautomation": as automation, digitalization and AI converge, laboratories evolve from isolated testing units into integrated diagnostic hubs. (Lab + Imaging)

Gruson D, Zima T, Plebani M. "Automation in Value-Based Laboratory Medicine." Clin Chem Lab Med 2026;64:1197–1200

BEFORE YOU IMPLEMENT

Challenges to Consider When Implementing TLA

1 Technical Barriers

- System integration & compatibility
- Technological complexity
- Data & specimen management

2 Operational Barriers

- Staff training and adaptation
- Workflow redesign & QC
- Continuous monitoring & validation

3 Financial Barriers

- High initial and ongoing costs
- Return-on-investment evaluation
- Scalability & financial planning

4 Organizational Culture

- Comprehensive training programs
- Change management & communication
- Leadership and cultural shift

Nam Y, Park HD. Ann Lab Med 2025;45:472–483 (Fig. 3).

THE NEXT FRONTIER

Beyond the Track: Cobots & Mobile Platforms

Even advanced TLA leaves pre- and post-analytical gaps that cobots and AMRs can close

1

Fixed TLA Tracks

Predictable, high-volume workflows: sorting, centrifugation, routing, archiving

2

Collaborative Robots (Cobots)

Sub-millimeter precision for bench tasks like colony picking and plate loading

3

Autonomous Mobile Robots (AMRs)

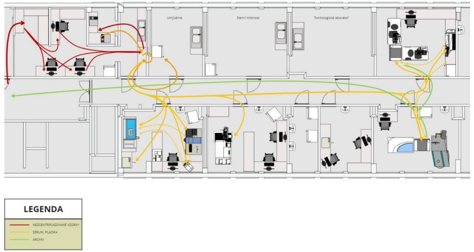
Reliable transport of specimens, carts and supplies across hospital floors

These elements become modular building blocks in a hybrid ecosystem, coordinated by an orchestration layer — not disconnected point solutions.

Mukherjee S, et al. "Collaborative Robotics, Mobile Platforms, and TLA in Clinical Diagnostics." Diagnostics 2026;16:518.

Case Study

Moravian-Silesian Hospital Havířov, Czech Republic



From a completely fragmented laboratory to a compact SNIBE SATLARS T8 total-automation solution

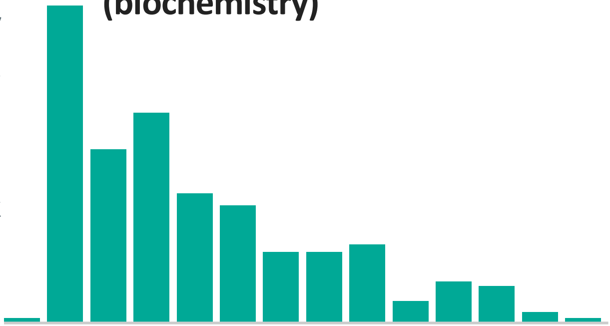
CASE STUDY · 1 OF 5

Hospital & Laboratory Context

Hospital Havířov is a regional acute-care hospital in the Moravian-Silesian Region, Czech Republic. Laboratory of Haemato-oncology and Clinical Biochemistry runs biochemistry, broad immunochemistry, urinalysis, serology, immunology, hematology, coagulation, cytomorphology, flow-cytometry, and blood bank testing. ***Biolab: ~ 1 million test per year.***

In June 2024, a full workflow audit of LIS data, laboratory sectors, and sample flow was performed to establish an evidence-based case for automation.

Peak Daily Test Volume (biochemistry)



Peak: ~995 tests at 07:00 — a sharp morning surge typical of acute-care demand

Workflow Audit — June 2024

Analysis of LIS data, laboratory sectors, sample flow, and current-state findings

Why automate now?
Rising volumes (10-15% per year), tight STAT targets, and a workforce that should focus on complex decisions — not manual tube handling.

Source: Nemocnice Havířov, "Workflow Analýza — Projekt automatizace laboratoře," 18 June 2024 (LIS data audit).

CASE STUDY · 2 OF 5

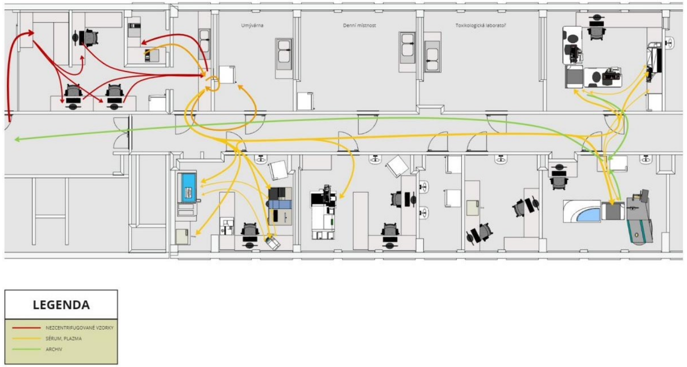
Before: A Laboratory Scattered Across the Floor

Six separate sectors, spread along one long corridor, 10 biochemistry and immunoassay analyzers, 5 manufacturers

Source: Nemocnice Havířov workflow audit, 18 June 2024 — current-state sector map.

CASE STUDY · 3 OF 5

Before: Chaotic Sample Flow & Audit Findings



KEY AUDIT FINDINGS

- ✕ Many manual steps: sorting, decapping, centrifuge loading
- ✕ A secondary tube created from every single sample
- ✕ Many different analyzers, spread far apart; sample flow chaos
- ✕ Fully manual validation of all results

What already worked well: sufficient qualified staff, STAT TAT targets met, fully electronic test requests.

Source: Nemocnice Havířov workflow audit, 18 June 2024 — sample-flow map and current-state findings.

The Solution: A Compact SNIBE SATLARS T8 System

Strict and transparent public tender; one connected line replaces six scattered sectors

Two Bioassays C8 units + one Maglumi X6, fed by a single automated pre-analytical line — one compact footprint, one workflow. Maglumi X3 as a stand-alone backup.

PRE-ANALYTICAL AUTOMATION

Input Module → Decapper → Automated Centrifuge → Recapper

↓

ANALYTICAL MODULE — SATLARS T8

Biossays C8
Biochemistry analyzer #1

Biossays C8
Biochemistry analyzer #2

MAGLUMI X6
Immunoassay analyzer

System configuration as implemented at Nemocnice Havířov, 2026.

CASE STUDY · 5 OF 5

The Transformation, Sector by Sector

Dimension	*Before: Fragmented*	*After: Compact TLA*
Layout	6 sectors along one corridor	One connected, compact line in a new re-built lab
Sample handling	Manual sorting, decapping, centrifuge loading	Automated input, decap, spin, recap
Analyzers	Multiple stand-alone instruments, far apart	2× Biossays C8 + 1× MAGLUMI X6, unified
Result validation	Fully manual verification	Automated auto-verification (plan)
Transport distance	Long, cross-corridor sample travel	Minimal — samples stay in-line

This directly addresses the opportunities identified in the June 2024 audit: fewer manual steps, shorter transport distances, and a modern, space-efficient working environment.

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LESSONS LEARNED

Critical Success Factors for monumental transformation challenge

Selecting the Right Partners

Phased Implementation

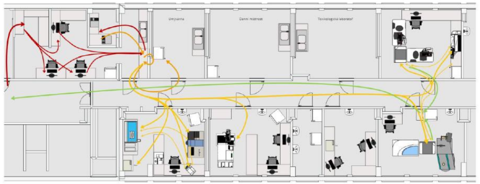
Strong Project Governance

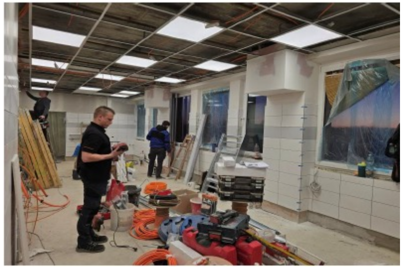
Continuous Team Developmen t

Success is a project-management challenge as much as a technical one.

- Vendor and integrator selection shapes the entire project's outcome
- Clear ownership, milestones and escalation paths prevent drift
- Roll out in stages — validate each module before adding the next
- Ongoing training builds confidence and sustains the gains long-term

The Result: From Chaos to Order and Harmony





- Revolutionary change in the biolab
- Transformation of 10 laboratory systems into a single platform dramatically increased workflow efficiency and improved the quality and speed of diagnostics
- Three months after installation began, the system was fully operational with excellent external QC results

ROADMAP

A Practical Path Forward

Now	1 Year	2–5+ Years
Audit current workflows and sample-flow bottlenecks against a target state; introduce auto-validation rules.	Implement TLA in priority sectors; connect the second MAGLUMI X6 into the T8; exploit middleware benefits; extend to hematology	Scale automation, extend to coagulation and molecular diagnostics; integrate AI-assisted QC.

Each phase builds evidence and confidence for the next — the same approach that carried Hospital Havířov from audit to a live compact TLA system.

KEY TAKEAWAYS

Three Things to Remember

01 Total Laboratory Automation turns a fragmented, error-prone workflow into one connected, predictable process — with documented gains in TAT, accuracy and footprint.

02 The benefits are not just technical: automation is a strategic enabler of value-based, patient-centered laboratory medicine, and increasingly extends beyond fixed tracks via cobots and mobile robots.

03 Hospital Havířov shows it works in practice: a compact SNIBE SATLARS T8 line replaced six scattered sectors with 10 analyzers — proof that fragmentation is not inevitable.

SOURCES

References

1. Nam Y, Park HD. "Revolutionizing Laboratory Practices: Pioneering Trends in Total Laboratory Automation." Ann Lab Med 2025;45:472–483.

2. Gruson D, Zima T, Plebani M. "Automation in Value-Based Laboratory Medicine: Driving Precision, Capacity, and Better Outcomes." Clin Chem Lab Med 2026;64(6):1197–1200.

3. Mukherjee S, Lambert C, Zhou Y, Kan S, Yang J, Liao G, Flygare S, Ohgami RS. "Collaborative Robotics, Mobile Platforms, and Total Laboratory Automation in Clinical Diagnostics." Diagnostics 2026;16:518.

4. Nemocnice Havířov. "Workflow Analýza — Projekt automatizace laboratoře." Internal workflow audit report, 18 June 2024.

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