Trends in laboratory impact: analysis of test demand and its evolution in recent years

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BACKGROUND

It is estimated that at least 60-70% of clinical decisions rely on laboratory test. The economic impact of laboratories in hospital budgets is substantial (2-3% depending on complexity). Maximizing the value and cost-effectiveness of laboratories requires analysis from hospital administrators and laboratory supervisors.

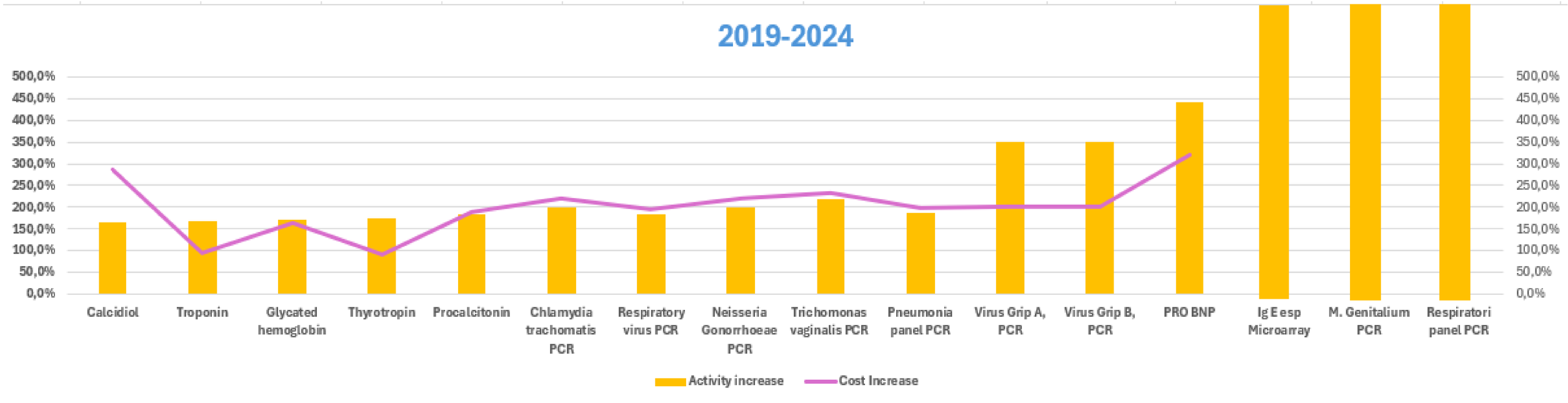
The aim of this study is to analyze the evolution of test demand at a regional hospital, identifying significant deviations in tests and in ordering clinical services.

METHODS

We analyzed the laboratory costs for this hospital from 2019 to 2024, with a detailed analysis of tests and orderers in 2024. COVID-related costs were excluded.

RESULTS

- **Between 2019 and 2024, the observed increases in laboratory costs were 6%, 0.3%, 14%, 8%, and 9%, respectively.**
- **The average test price in our laboratory increased by 5-6% (including a tariff review in 2021).**
- **In the last few years we observed no significant increase in the number of laboratory orders but observed a significant rise in the number of tests per order (15%).**
- **The tests that have increased their activity by more than 70% since 2019, in ascending order, are: calcidiol, troponin, glycated hemoglobin, thyrotropin, procalcitonin, Chlamydia/gonococcus PCR, PCR for respiratory virus, pro BNP, and IgE microarray.**



- **The clinical services that show an increase in laboratory orders are: rheumatology, infectious diseases, cardiology, emergency department and endocrinology.**

CONCLUSIONS

- ✓ **Laboratory costs are increasing despite the end of the pandemic. Laboratory orders are more extensive in the recent years.**
- ✓ **This study provides specific information on tests and clinical services that could have the most significant impact on laboratory trends in recent years.**
- ✓ **Laboratory evolution towards molecular biology tests has increased economic impact.**
- ✓ **The laboratory must actively participate in demand optimization.**
- ✓ **The laboratory is a fundamental part to optimize demand, and it is important to analyze trends.**
- ✓ **A limitation of the study is that it would need to compare these analyzed activity and cost results with hospital evolution during this period and their impact in patient health.**

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OPTIMIZING LABORATORY EFFICIENCY LEAN MANAGEMENT TO ELIMINATE MUDA AND IMPROVE TURNAROUND TIMES IN ONCOLOGICAL PATIENTS

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Background - Aim

Muda, meaning "waste" or "inefficiency", is a key concept in Lean Management (LM) phylosophy, which aims to eliminate non-value-adding processes. Laboratories play a vital role in providing timely results, especially for oncological patients, as critical clinical decisions depend on them. This study aimed to eliminate muda from laboratory workflows to achieve 95% of oncological lab test results delivered within one hour.

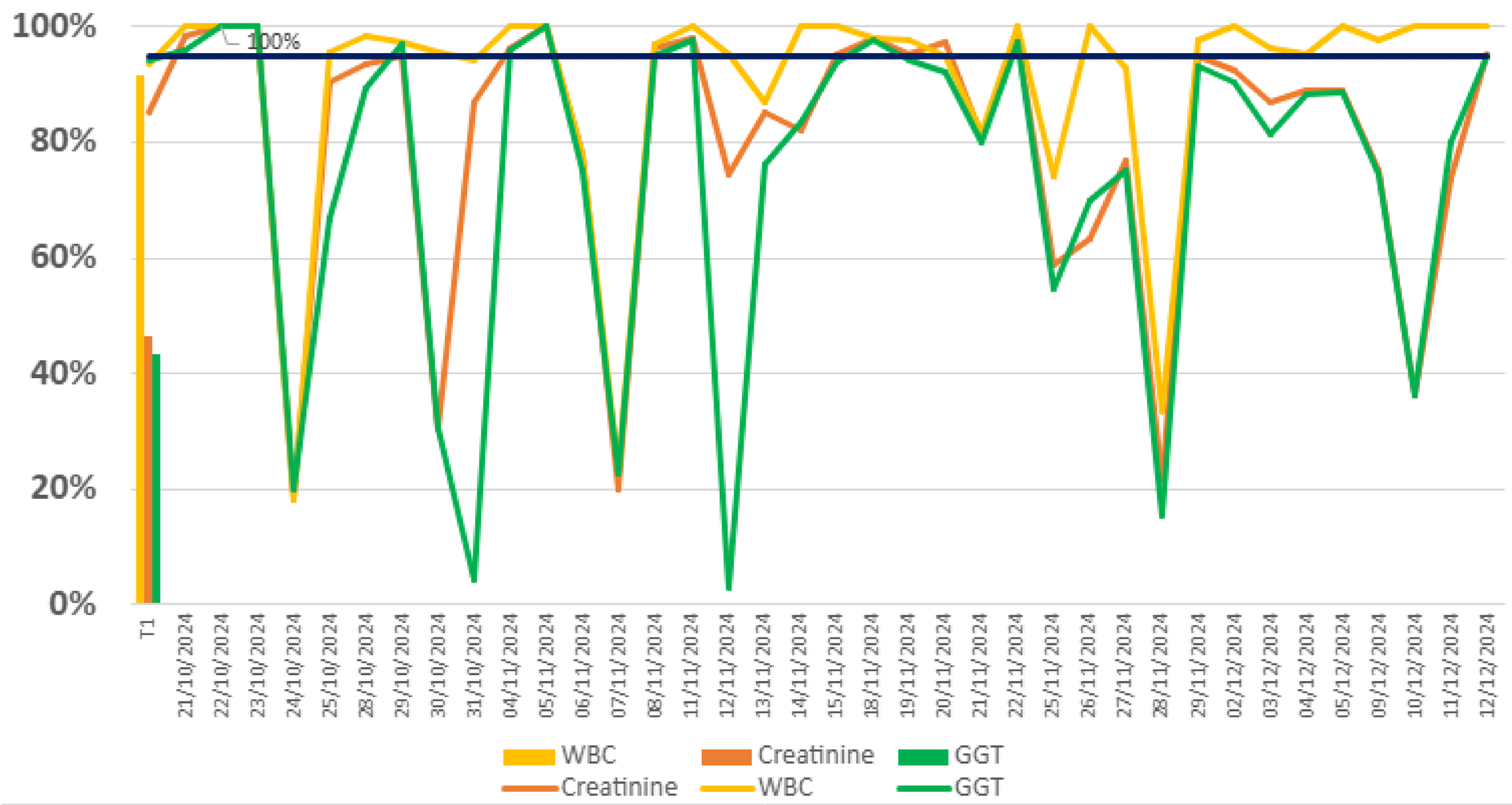
Methods

The study was conducted in a 380-bed hospital laboratory, handling 20–60 oncological requests daily out of 650 total requests. Preanalytics were non-automated. A seven-person LM team (1 engineer, 3 lab technicians, 1 lab supervisor and 2 clinical pathologists) worked over nine days distributed between June and October 2024 to eliminate muda. Standard operating procedures (SOPs) were created for admin staff, preanalytics, biochemistry, haematology, the Emergency Department, supply chains, and clinical validation. TAT for oncological samples was extracted from the LIS (Servolab4, *Siemens Healthineers*) pre-intervention (T1: April 2024) and post-intervention (T2: mid October–mid December 2024) for CBC, creatinine (CRE), and gamma-glutamyl transferase (GGT).

Results

At T1, TAT within one hour was achieved for 91% of CBC, 46% of CRE, and 43% of GGT (see Figure 1). Mudas eliminated were (1) unnecessary transportation (ex. reagents), (2) waste of overproduction (phone calls requesting results, doubt resolution), (3) unnecessary inventory and (4) waste of movement.

Figure I. TAT for oncological samples. Pre-intervention (T1: April 2024) and post-intervention (T2: mid October–mid December 2024) for CBC, creatinine (CRE), and gamma-glutamyl transferase (GGT).



At T2 (post-intervention), TAT improved to 81% for CRE and 76% for GGT, while CBC remained 91%. Excluding three days when SOPs were not followed, TAT rose to 96% for CBC, 85% for CRE, and 80% for GGT (see Figure 1).

Conclusions

Eliminating muda allows technicians to focus on value-adding tasks with resources readily available. SOPs ensure efficient workflows. SOPs may not always be followed due to a variety of factors, such as resistance to change or simply forgetfulness. LM enables laboratories to improve safety, productivity, and process quality while reducing waste, ensuring timely delivery of results for oncological patients.

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IMPACT OF BLOOD COLLECTION TUBE CHECK-IN DIGITALISATION ON TURNAROUND TIME: A FOUR-LAB STUDY

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Background - Aim

The traditional blood collection tube (BCT) check-in process relies on manual verification of patient details and appropriate tube collection for requested tests, which is time-consuming and prone to errors. This study aimed to analyse the impact of BCT check-in digitalisation on reducing turnaround time (TAT) in four spoke laboratories.

Methods

A new Laboratory Information System (LIS) module (Servolab4, Siemens Healthineers) was developed to digitalise BCT check-in in spoke labs with non-automated preanalytics. Previously, manual verification took considerable time (e.g., Lab1 spent 3 hours daily). The new system linked automatic barcode scanning of BCTs by laboratory analysers with real-time LIS status updates. Its impact was analysed in four spoke labs. Labs 1–3 implemented the system in May '24, and Lab4 in Oct '24. Two periods were assessed: pre-intervention (T1: Mar'24 for Labs 1–3, Sep'24 for Lab 4) and post-intervention (T2: Jun'24 for Labs 1–3, Nov'24 for Lab 4). Time from registration to available result for routine samples, including white blood cell count (WBC), potassium (K), and international normalised ratio (INR), were extracted from the LIS as indicators of EDTA K3, serum, and citrate tubes. Median (P50) and 90th percentile (P90) TATs were calculated from registration to results availability.

Results

For T1, 9,615 K, 9,979 WBC, and 4,421 INR tests were included across the four labs, versus 9,091, 10,528, and 4,697 for T2 (see Table I).

Table 1. Time from registration to available results (expressed in P50 and P90) in T1 (pre-intervention) and T2 (post-intervention) for white blood cell count (WBC), potassium (K) and international normalised ratio (INR) across labs.

LAB #1		N	Time from registration to available result	
			P50 (min)	P90 (min)
K	T1	4.278	29	66
	T2	3.389	31	75
WBC	T1	3.701	19	57
	T2	4.241	14	51
INR	T1	1.414	38	64
	T2	1.559	36	66

LAB #2		N	Time from registration to available result	
			P50 (min)	P90 (min)
K	T1	2.611	43	88
	T2	2.924	35	86
WBC	T1	2.949	16	42
	T2	2.924	15	42
INR	T1	1.435	22	46
	T2	1.525	20	37

LAB #3		N	Time from registration to available result	
			P50 (min)	P90 (min)
K	T1	1.148	114	161
	T2	1.275	124	188
WBC	T1	1.310	117	185
	T2	1.442	43	95
INR	T1	576	68	134
	T2	682	68	124

LAB #4		N	Time from registration to available result	
			P50 (min)	P90 (min)
K	T1	1.578	86	135
	T2	1.503	72	117
WBC	T1	2.019	46	96
	T2	1.975	36	83
INR	T1	996	68	121
	T2	931	65	114

Following digitalisation, as detailed in Table 1, WBC TAT notably decreased in all labs, with Lab #3 showing the largest reduction in P50 (74 minutes, from 117 to 43). Labs #1 and #2 had smaller P50 decreases (5 and 1 minute, respectively), and Lab #4 had a 10-minute reduction. Potassium TAT showed uneven performance: Lab #2 improved from 43 to 25 minutes, and Lab #4 from 86 to 72, while Lab #1 and Lab #3 increased by 2 and 10 minutes, respectively. Finally, INR TAT was reduced or unchanged in all labs: Labs #1 and #2 saw a 2-minute P50 decrease, Lab #3 remained steady, and Lab #4 improved by 4 minutes.

Conclusions

BCT check-in digitalisation improved TAT, especially for WBC, with mixed effects on K, and stable INR times. Overall, the system streamlined workflows and reduced errors, underscoring the value of digital solutions for efficient, accurate lab services. Further refinement may maximise these gains, enhancing patient care.

EVALUATION OF A CONTINGENCY STRATEGY FOR NON-INVASIVE PRENATAL TESTING: EFFECTIVENESS AND COST-SAVINGS IN A SCREENED POPULATION

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BACKGROUND-AIM

Non-invasive prenatal testing (NIPT) is a sensitive screening test for common fetal aneuploidies. Depending on the government healthcare system, NIPT can be offered to all pregnant women or, alternatively, as a second-tier test based on the results of the first-trimester combined screening (1TCS). The contingency strategy appears to improve the detection rate at a lower cost, although the optimal implementation approach remains controversial.

The aim of this study is to evaluate the effectiveness and cost-savings of the scheme implemented in our screened population.

METHODS

This is an observational, retrospective study of the NIPT scheme performed in our laboratory in 2022 and 2023. According to the Catalonia 1TCS guidelines, NIPT is offered to those with high (1/11-1/250) and intermediate (1/251-1/1100) risk results. The high-risk category aims to reduce invasive procedures, while the intermediate-risk category aims to increase the detection rate. A direct invasive test is recommended when the risk, labeled as very high, drops below 1/10. Positive NIPT results were confirmed by invasive testing. The biochemical screening costs €20 per test, while the NIPT costs €239.

RESULTS

Pregnant women screened (yrs. 2022-2023)		4,023
Risk cases identified	Very high	25
	High	127
	Intermediate	359
Performed NIPTs		418
Aneuploidies diagnosed (total=23)	Trisomy 21	19
	Trisomy 18	1
	Trisomy 13	1
	Others	1 Turner (including 1 cr. 18 inversion)
Intermediate-risk group Down syndrome cases		3 (risk levels: 1/608, 1/1089, 1/1092), including one multiple pregnancy
False positive by NIPT		1 trisomy 13
Unexpected aneuploidy post-termination		None

CONCLUSION

The contingency strategy achieved a 100% detection rate based on the analyzed data.

Three intermediate-risk cases of aneuploidy were identified in our data series, thereby supporting the scheme.

Compared to universal NIPT screening, our approach saved €539.000 annually for the local healthcare budget.