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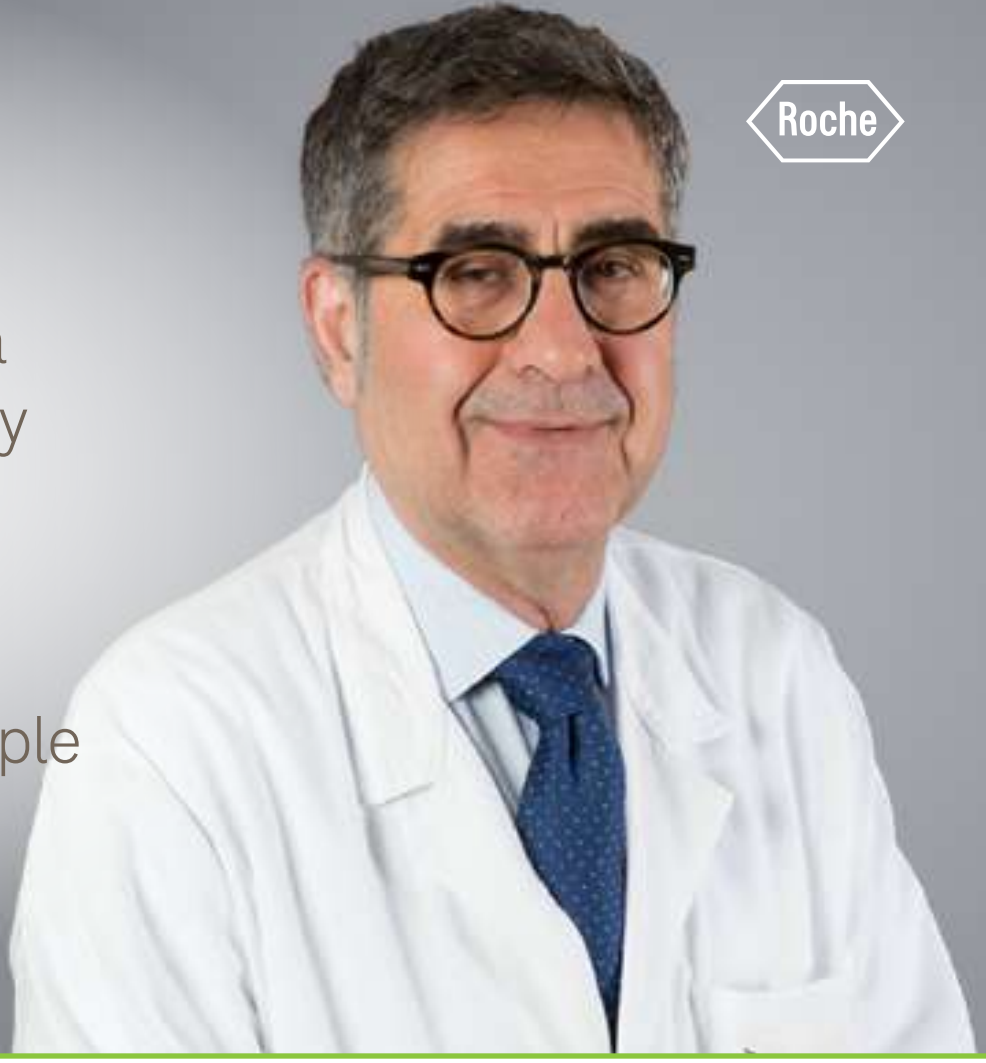
Analytics for Core lab
Case Study

Data analytics in a Clinical Laboratory for patient path optimization: the Emergency Department example



The patient journey redesign based on a digital solution for data analysis improves operational processes and decision support inside and outside the laboratory.

With an increasing number of patients presenting through emergency departments (EDs) annually, overcrowding and long wait times are major concerns for hospitals.[1]

Long ED stays can have profound consequences, such as avoidable medical errors, negative impact on patient outcomes and higher mortality.[2,3,4,5]

Results of laboratory tests ordered in the ED are an important factor in patient management decisions. Appropriate triage and discharge of patients are impacted by the timely return of laboratory test results[2,6], making turnaround time (TAT) of laboratory tests a key contributor to ED workflow.[6] The ability to provide fast turnaround of samples is considered an essential performance metric of the laboratory[6,7] and appears to improve the operational efficiency of ED.[8,9,10]

That said, significant improvement areas exist in Lab-ED processes and collaboration that can unlock potential for innovative biomarkers and new indications: for example accelerated algorithms for TnT hs test for AMI diagnosis, as recommended by ESC guidelines.[11]

Value-Based Health Care (VBHC) is a patient-centered approach to healthcare delivery focused on improving the health outcomes that matter most to patients across the entire patient journey while optimizing healthcare resources and cost to the healthcare system including Emergency Departments. Indeed VBHC provides the tool and frameworks to guide efforts in ED optimization. It includes a shift in the reward system, incentivising improvements in value rather than volume through alternative payment models. In this context, it is crucial to understand how diagnostics can add value to the healthcare system.

Some years ago, the European Society of Cardiology and the American College of Cardiology recognized the pivotal role of biomarkers and made elevations in their levels the “cornerstone” of diagnosis of acute myocardial infarction. Since then, Troponin is the biomarker of choice for the detection of cardiac injury. Acute myocardial infarction (AMI) defines cardiomyocyte necrosis in a clinical setting consistent with acute myocardial ischaemia. A combination of criteria is required to meet the diagnosis of AMI, namely the detection of an increase and/or decrease of a cardiac biomarker, preferably high-sensitivity cardiac troponin (hs-cTn) T or I, and symptoms of myocardial ischaemia, ischaemic ECG changes, pathological Q waves on ECG, imaging evidence of loss of viable myocardium or new regional wall motion abnormality in a pattern consistent with an ischaemic aetiology, or intracoronary thrombus detected on angiography or autopsy.[11]

Ospedale San Raffaele is a university hospital situated in Milan, Italy. It is a multispeciality center with more than 50 clinical specialities available and with over 1300 beds. It is accredited by the Italian National Health System to provide care to both public and private, Italian and international patients. The lab conducts 7.5 million tests per year, with more than 1500 different tests available.

How does laboratory medicine drive value?

It is important says that there are two areas in which laboratory can generate value:

1. Through new innovative biomarkers to enable better & more accurate decision making.
2. Through improving the efficiency to provide test results faster and optimizing hospital resources.

This project focuses on the second area and in order to improve it, it's necessary to focus on[12]:

1.- Automation technologies
2.- Data analytics
3.- Process optimization

Ospedale San Raffaele's experience

Despite the difficulties in integrating laboratory data with clinical data, data analytics tools enable the measurement of state of the art of laboratory processes, targeted improvement interventions and results monitoring. Indeed, through the use of data analytics tools the laboratory is able to create measurable value for clinicians and patients by providing faster and more efficient response.

In this context, the team led by Dr Locatelli conducted a VBHC project for San Raffaele Hospital's new Emergency Department, which opened in September 2021.

The focus was on three main areas:

- Improve the Lab's turnaround time (TAT) for the Emergency Department.
- Reduce ED Length of Stay.
- Pave the way to the adoption of the troponin accelerated algorithm as recommended by 2020 ESC guidelines.[13]

Project areas

Laboratory

Process improvement with Lean methodology for the hs-TnT test

Emergency department

Patient journey analysis and process optimization in the collection phase

Efficient management of patients with suspected acute myocardial infarction in the emergency department by leveraging the value of diagnostics

Thanks to the use of **navify®** Analytics and the follow-up of the Roche Healthcare Consulting team, the team identified areas for the optimization of both extra-laboratory flows and pre-analytical and analytical flows of the Troponin test, improving the communication between the laboratory and the emergency department.

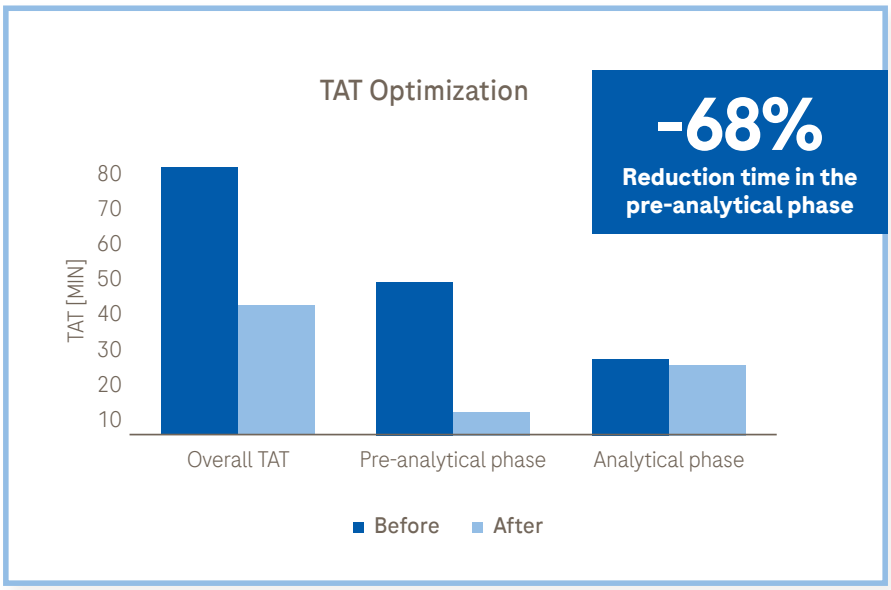
The integrated solution included three main aspects: a redesign and simplification of the sample journey between the emergency department and laboratory, weekly performance reports to monitor efficiency through **navify®** Analytics, and the review of suspect AMI patient journeys to reduce blood sampling time and enable troponin accelerated algorithms.

The test flows were re-engineered: all the urgent samples are now sent via pneumatic post to the integrated pre-analytic and analyzers for immediate processing. Subsequently, the monitoring of the TATs of the analytical phase validated the introduction of the STAT method and confirmed an optimal analytical performance.

The outcomes

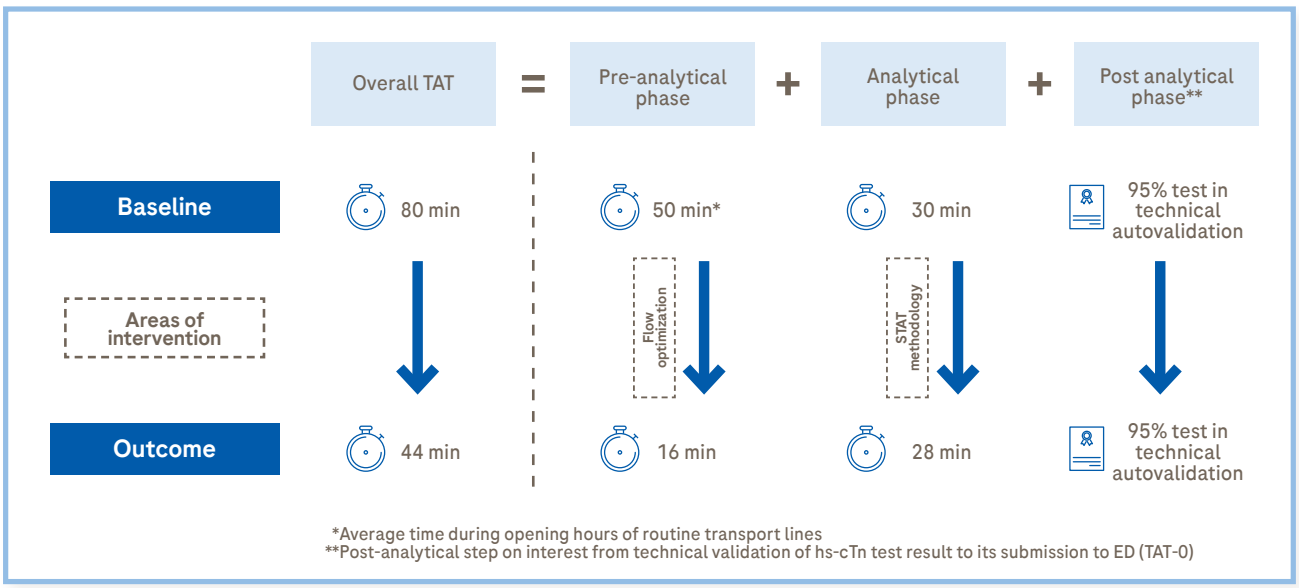
TAT Optimization - 68% reduction in the pre-analytical phase

By monitoring the data on **navify** Analytics, the laboratory has identified the opportunity to reduce the TATs of the urgent Troponin tests requested by the ED.



*"As a result of the change in the sample transmission flow, the pre-analytical 90th percentile TAT decreased from 50 to 16 minutes. The intervention in the pre-analytical phase, in conjunction with the introduction of the STAT method, resulted in a **reduction in the overall 90th percentile TAT from 80 to 44 minutes.**"*

Dr Massimo Locatelli | Head of Laboratory Medicine



*Average time during opening hours of routine transport lines
**Post-analytical step on interest from technical validation of hs-cTn test result to its submission to ED (TAT-0)

This information is based on 90th-percentile turnaround times.

In addition the laboratory improved efficiency by increasing automation and standardization of post-analytical phase allowing faster transmission of results to the ED

Increase in the value of lab diagnostics

The team integrated data analysis into the laboratory routine to improve the analytical process. Laboratory testing is considered a key factor in the emergency department, since it allows for the following:[2,7,10]

- A reduction in patient waiting times;
- An improvement in staff satisfaction;
- A reduction in risks associated with incorrect diagnosis or inappropriate treatment of a patient who, in this way, receives a faster and more appropriate treatment.

"The evidence collected made it possible to reduce the execution times of a clinically strategic test for the diagnosis of Acute Myocardial Infarction by 45%."

Dr Massimo Locatelli | Head of Laboratory Medicine

That is the reason why optimization in this process is recognized as a priority by hospitals and professionals. The troponin test is one of the most important markers for the diagnosis of myocardial infarction (MI), but also for acute coronary syndrome monitoring in patients with suspected myocardial infarction or unstable angina.

Simplify data gathering, and accelerate decision making

The lab implemented a workflow review and obtained a substantial improvement of their execution times to benefit patients in critical conditions.

Disclaimer: Individual lab results may vary, and testimonials are not claimed to represent typical results. All testimonials are real participants, and may not reflect the typical purchaser's experience, and are not intended to represent or guarantee that anyone will achieve the same or similar results.

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