

# EVALUATION OF EFFECTIVENESS OF A NEW PNEUMATIC TUBE SYSTEM FROM THE EMERGENCY ROOM

V. Polesello <sup>(1)</sup>, R. Dittadi <sup>(1)</sup>, G. Bassan <sup>(1)</sup>, H. Afshar <sup>(1)</sup>,  
M. Rosada <sup>(2)</sup>, S.Zin <sup>(3)</sup>, D. Facchini <sup>(3)</sup>, P. Carraro <sup>(1)</sup>

<sup>(1)</sup> *Laboratorio Analisi, Ospedale Dell'Angelo, ULSS3 Serenissima, Mestre (Venezia)*

<sup>(2)</sup> *Accettazione e Pronto Soccorso, Ospedale dell'Angelo, Venezia*

<sup>(3)</sup> *EOS S.R.L., Padova*

## KEYWORDS

Turnaround Time, Pneumatic Tube System, Emergency Room

## INTRODUCTION

Therapeutic turnaround time (TAT) and process traceability are critical issues for First Aid laboratory tests. There is a wide variability in pre-analytical activities from blood sampling to laboratory arrival. These phases account for over 20% of the total TAT. Aim of this work is to evaluate the improvement of TAT after activation of the Tempus600<sup>®</sup> system, its impact on the organization of Emergency Room and on the integrity of blood samples.

Station of departure in Emergency Room



Station of arrival in Laboratory



## METHODS

Until December 2017, the pre-analytical flow at the Emergency Room of Hospital dell'Angelo (Mestre-Venice) included: 1) blood collection, 2) registration of the requests, 3) application of identification labels, 4) storage of specimens in the sending area, 5) manual transportation by a courier every 20 minutes, a path of 150 meters and 1 floor of stairs to get to the laboratory. TEMPUS600<sup>®</sup> (produced by Timedico A/S, Bording, Denmark and enhanced by EOS srl, Padova, Italy), is an innovative Pneumatic Tube System (PTS) that allows to send blood samples immediately to the Laboratory, by tubular path (internal diameter 2.5 cm) with compressed air system. Containers are not needed. In addition, each tube is scanned and registered at departure and upon arrival in the laboratory. To test the integrity of the samples, 49 pairs of sample transported with manual handling and with PTS was evaluated for Potassium, pancreatic amylase, AST, ALT, total bilirubin, LDH, PCR, creatinine, hsTnI, considering the analytical imprecision and Total Error allowable (TEa). Moreover, 130 pairs of samples were further tested for K and LDH.

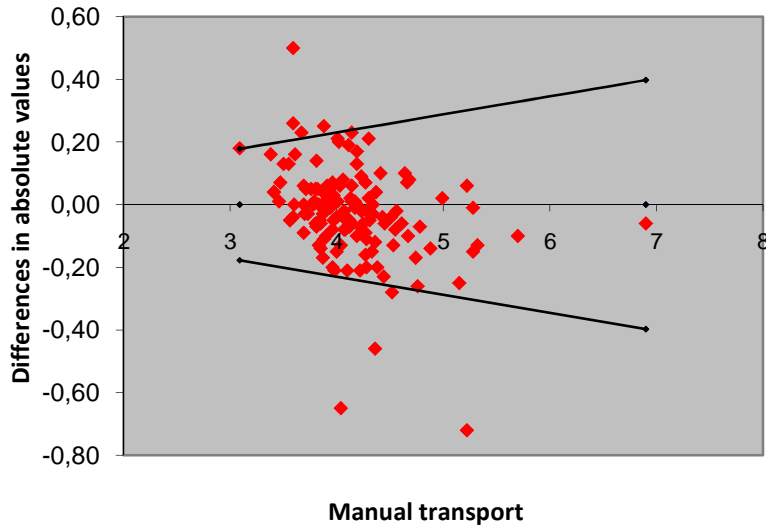
## RESULTS

In a one month comparison, the improvement of total TAT was 17 minutes, both as median and as 90° percentile (Table 1). The time from the decision of testing and the arrival to the laboratory was reduced from 45 minutes to 28 minutes. Regarding stability, all analytes showed no statistically significant difference between manual transport and via PTS, except K and LDH. K differences resulted a little higher than the analytical variability but can be considered within the limits of the TEa (Figure 1, Table 2), while for LDH the 14.6% of cases exceeds both the limits with a mean overestimation (+4%) (Figure 2, Table 3). The new organization allowed the suppression of phases 4 and 5 with a reduction of FTe (Full-Time equivalent) of 1,24. The complaints about delays to the laboratory were reduced.

**Table 1:** Comparison between TAT before and after the introduction of Pneumatic Tube System (PTS) and correlated improvement.

	Manual transport	Transport via PTS	Improvement
Median	00:27:00	00:09:24	<b>00:17:36</b>
90° Percentile	00:45:54	00:28:03	<b>00:17:51</b>

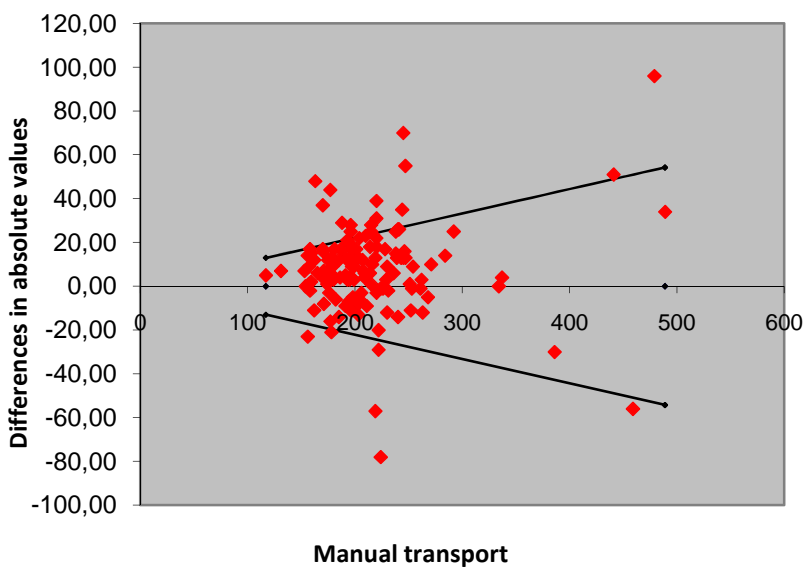
**Figure 1:** Bias-plot. Comparison between Potassium assays in 130 pairs of samples: manual transport (reference) vs PTS.



**Table 2:** Potassium. Biases calculated between the two type of transports.

Average	-0,50%
Median	-0,59%
2.5° Percentile	-5,99%
97.5° Percentile	6,15%
TEa (Biological Variability)	5,80%

**Figure 2:** Bias-plot. Comparison between LDH assays in 130 pairs of samples: manual transport (reference) vs PTS.



**Table 3:** LDH. Biases calculated between the two type of transports.

Average	3.63%
Median	4.18%
2.5° Percentile	-12.83%
97.5° Percentile	22.13%
TEa (Biological Variability)	11.4%

## **CONCLUSIONS**

In our experience, the installation of TEMPUS600<sup>®</sup> has significantly reduced the TAT and has brought great benefits regarding the management of workflow in Emergency Room.

## **REFERENCES**

*Andersen, I. B., Mogensen, N., & Brandslund, I. (2016). Stability of biochemical components in blood samples transported by Tempus600/Sysmex GLP Robot Reception System. The Journal of Applied Laboratory Medicine 2017; 1: 376-86*

*White, B. A., Baron, J. M., Dighe, A. S., Camargo Jr, C. A., & Brown, D. F. Applying Lean methodologies reduces ED laboratory turnaround times. The American journal of emergency medicine 2015; 33: 1572-6.*