



# HOW CAN SIX SIGMA BE APPLIED IN IMPROVING THE SERVICE OF MEDICAL LABORATORIES TO PATIENTS?

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## BACKGROUND

Six Sigma is one of the quality assurance tools within the Health Care industry. It is a methodology to reduce errors and defects by applying different statistical and managerial tools. Although Six Sigma can be applied to various areas of medical laboratories, we focused on improving customer turnover times at the phlebotomy sites of our laboratory.

## PATIENTS AND METHODS

Our clinical laboratory provides phlebotomy services for outpatients. There are 3 on-site locations for outpatient blood draws. The primary outpatient phlebotomy area draws samples from 160 patients and obtains 500 specimens per day in average during the week. It is staffed by 7 phlebotomists and operates between the hours of 7:00 and 12:00 AM. We investigated customer turnover time at the outpatient phlebotomy site in a week (all patients were 779), from day to day. Six Sigma techniques were used with Minitab to optimize services of phlebotomy station.

## RESULTS AND DISCUSSIONS

First we created the main process map of phlebotomy workflow (Fig.1.) and defined the customer turnover time (Fig.2.). Customer turnover time (CTT) at phlebotomy consists of times from arrival of patient to registration (named Time 1), from registration to phlebotomy (Time 2) and the actual time of phlebotomy (Time 3). We show average CTT (Fig.3.). We investigated the summary of CTT in a week (Fig.4.) summary of Time 1 (Fig.5.) and summary of Time 2 (Fig.6.) to improve those. As Time 3 was acceptable, so we analysed only CTT, Time 1 and Time 2 from day to day (Fig.7-9.). It was founded, that CTT was longer on Monday and Tuesday than other days, which has two reasons. On the one hand, lots of patients have already arrived for opening of phlebotomy site or long before (Fig.10.). On the other hand the front desk window opening was non-continuous (Fig.11.).

Figure 1.

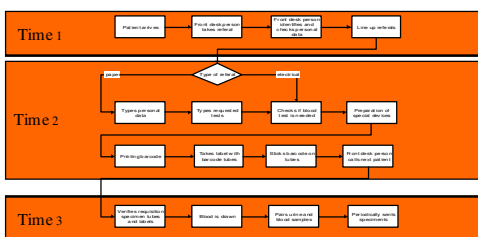


Figure 2.

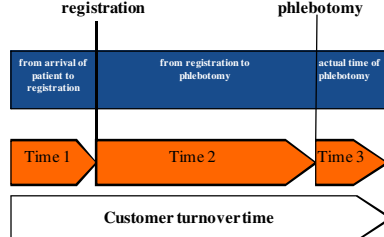


Figure 3.

Waiting time [min]	Count	Mean	StDev	Min	Q1	Median	Q3	Max
Time 1	779	15,3	12,4	0	6	13	21	98
Time 2	779	41,8	22,0	1	23	41	56	170
Time 3	779	1	0,46	0,5	0,8	0,9	1,2	2
Customer turnover time	779	57,1	25,3	3	38	57	80	178

Figure 4.



Figure 5.

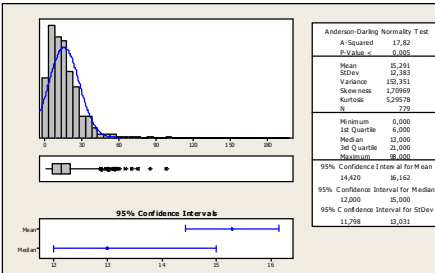


Figure 6.

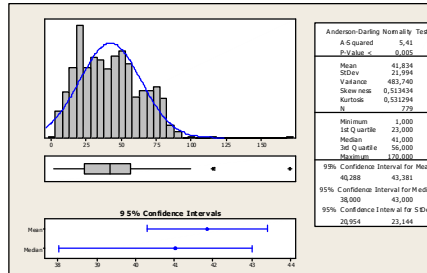


Figure 7.

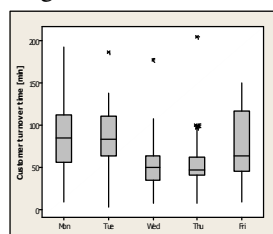


Figure 8.

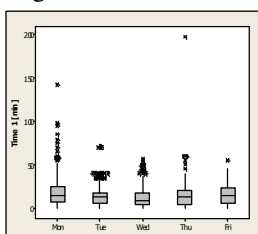


Figure 9.

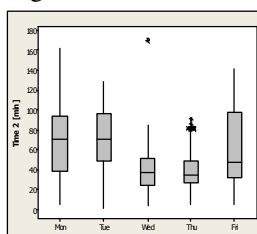


Figure 10.

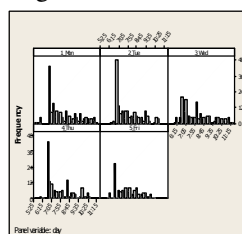
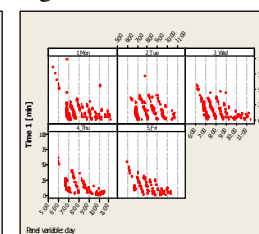


Figure 11.



## CONCLUSION

As a result of present internal audit the CTT is open to improvement if the opening of phlebotomy site was 30 minutes earlier and the front desk window opening was continuous. This pilot project demonstrates how Six Sigma methods can be used in quality improvement of medical laboratory services.