

Background

The University of California San Francisco (UCSF) Mission Bay's (MB) Adult Infusion Center (AIC) is addressing the growth and complexity of cancer and cancer care by opening the Precision Cancer Medicine Building (PCMB) last June 2019. It added 47 more infusion bays to its existing AIC in the Gateway Medical Building (GMB).

The delivery of chemotherapy to cancer patients is a complex multifaceted process involving concerted efforts by multiple departments including the Clinical Laboratory (ClinLab). The ClinLab plays an essential part in providing timely, high-quality, and valuable test results to initiate and evaluate treatment modalities in chemotherapy infusion. Conversely, lagging laboratory turn-around-time (TAT) contributes to a long unoccupied patient wait times and patient dissatisfaction. The current unsatisfactory complete blood count with differential (CBCD) TAT along with an anticipated increase in patient volume, the AIC and ClinLab formed an interdisciplinary team to address the problem.

This evidence-based project (EBP) aims:

Outcome Aim:

To reduce complete blood count with differential (CBCD) turn-around-time (TAT) from 90th percentile median TAT of 75 minutes to 60 minutes by December 31, 2019.

Process Aims:

Adult Infusion Center (AIC). To increase receipt of CBCD specimens using the STAT biohazard bags with the "infusion" stickers from 75% to 95% by December 31, 2019.

Central Processing (CP-Clinlab). To increase CBCD samples brought to HD within 5 minutes at 30% by December 31, 2019.

Hematology Department (HD-ClinLab). To decrease the baseline 90th percentile Test-Res TAT of 45 minutes to 41 minutes by December 31, 2019

Theoretical Framework

Theory of Constraints by Dr. Eliyahu Goldratt (1984)

The Thinking Process Tools asks the questions:

What to change?

What to change to?

How to cause the change?



The theory views organizations as a chain of departments and functions and that weakness in the chain limits the strength and performance of any organization. The tools examine complex phenomena within organizations and that there is an inherent simplicity – simple mechanisms or governing laws within it and constraints that can be exploited.

Project Interventions and Results

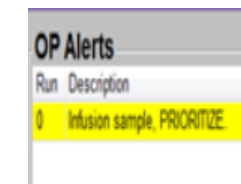
Col-Rec TAT: TAT from AIC blood collection to receipt in CP.

Intervention: AIC to place "infusion" stickers on STAT biohazard bags.



Rec-Test TAT: TAT from specimen receipt in CP to specimen barcode read in the Sysmex XN analyzer.

Intervention: Deliver specimens to HD within 5 minutes of receipt from AIC, designating a sorter hospital lab technician (HLT) and a paging system.



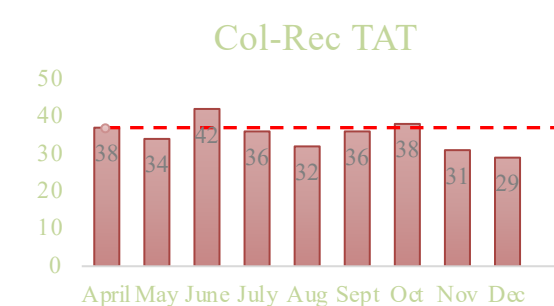
Test-Res TAT: TAT from specimen barcode in the Sysmex XN analyzer to results validation.

Intervention: Set up an AIC specific operational (OP) alert for Clinical Laboratory Scientists (CLS) as a flag to prioritize specimen.

Total TAT: TAT from time of blood collection to results validation.

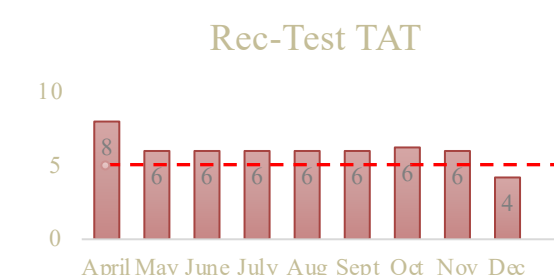
AIC.

AIC achieved 100% compliance of specimens in STAT biohazard bags with "infusion" stickers on the outside top portion of the bag by September 2019. This resulted to a nine-minute reduction in Col-Rec TAT.



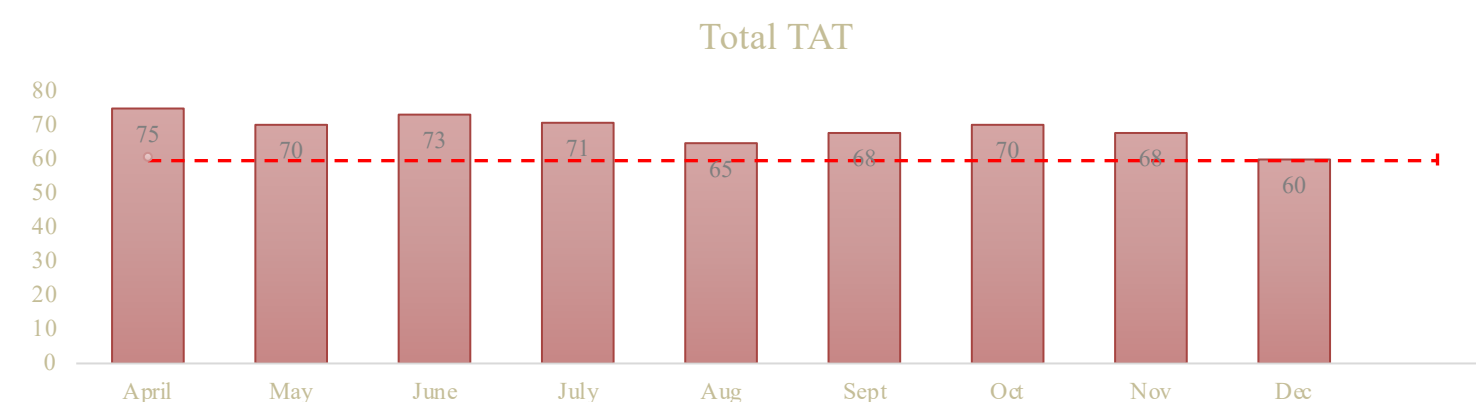
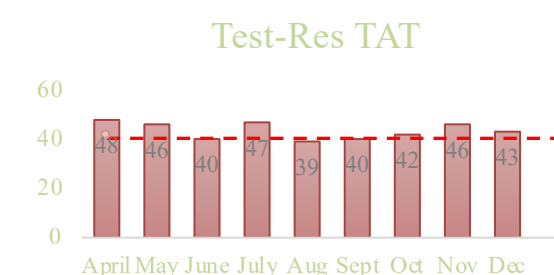
CP.

CP reached 30% of AIC specimens from the time of receipt to delivery in HD within 5 minutes by December 31, 2019. This resulted to a four-minute reduction in Rec-Test TAT.

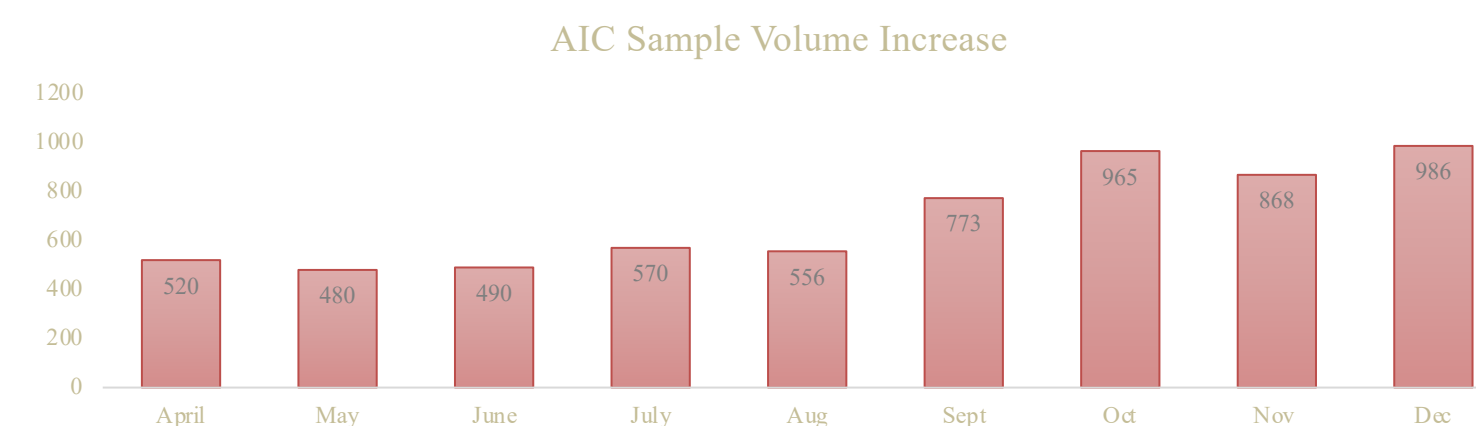


HD.

HD processing time decreased from forty-five minutes to forty-three minutes by December 31, 2019. This resulted to a two-minute reduction in Test-Res TAT.



By December 31, 2019, the sixty-minute total TAT goal was achieved.



At the conclusion of the project, CBCD patient volume increased about ninety percent from the baseline of 520 samples in April 2019.

Discussion

The trend toward ambulatory patient care in our current health care system will likely persist because of cost-effectiveness and desirability for the majority of patients and families (Hendershot et al., 2005). As a result, it can also lengthen wait times and therefore contribute to considerable stress for patients and families attending outpatient clinics. Our EBP initiative using the theoretical framework of the Theory of Constraints exploiting constraints and simplifying the process reduced CBCD TAT. With the decreased in laboratory CBCD TAT results, we anticipate:

- Decreased patient wait times, thereby improving patient satisfaction;
- Patient inflow and outflow is improved;
- Increase utilization of infusion bays, adding more infusion appointments per weekday, projecting an additional income of more than \$1.5 million annually. This calculation uses the chemotherapy, IV infusion price of \$1,321.00 ("Pricing transparency," n.d.) with ten additional patients per weekday.

Limitations:

- Study settings and hematology analyzers may be unique to UCSF MB AIC and ClinLab.
- Additional tests, such as Chemistry tests, also influence the qualifications of on-the-day infusion treatment of the patient which is beyond the scope of this EBP.

Future Directions:

- Incorporating the Total Laboratory Automation System (TLAS) may further decreased the Col-Rec and Rec-Test TAT of CBCD testing.
- Improved panic value calling workflow may impact the Test-Res TAT
- The Pediatric Infusion Center (PIC) in UCSF MB may benefit from this EBP.

References

- Eby, K. (2017). Everything you need to know about theory of constraints. Retrieved from <https://www.smartsheet.com/all-about-theory-of-constraints>
- Hendershot, E., Murphy, C., Doyle, S., Van-Clicaf, J., Lowry, J., Honeyford, L. (2005). Outpatient chemotherapy administration: Decreasing wait times for patients and families. *Association of Pediatric Oncology Nurses*.22(1), 31-37. <https://doi.org/10.1177%2F1043454204272539>
- Yi, X., Ki Yun Leung, E., Mika, D., Wolsky, R.J., Van Slambrouck, C., Leanse, J., ... Yeo, K.T.J. (2018). Reengineering critical laboratory testing for timely chemotherapeutic management. *The Journal of Applied Laboratory Medicine*, 3(2), 240- 249. <https://doi.org/10.1373/jalm.2017.025973>