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Research Article

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Study on Improvement of Turn around Time "TAT" in chemistry profile for Accident and Emergency department at a tertiary care medical institute

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Abstract *Background:* TAT could be a sample sent from ward till report out from lab, sample received on dispatching lab counter till reporting from respective lab or sample received in respective clinical labs section and reports availability. Aim: Trend analysis of TAT for our emergency chemistry profile tests of last five years (2019-2015), was assessed in this report, based and established on pattern, requirements and requests generated by our AED (accident and emergency department). *Materials and Methods:* We profiled and studied Turn around Time (TAT) for generally requested parameters, urea, creatinine, electrolytes, Troponin I, Liver function tests, calcium, magnesium and phosphorous. Starting from 2014 Dec, our analytical efficiency to facilitate AED has been accelerated, by providing results within 1 hour (60 minutes) and then gradually go down to within half hour (25 minutes) over a period of 5 years. For this milestone, we dedicated our staff to perform (analyzed) and report AED requests as per designated TAT. Additional analyzers for routine chemistry and electrolytes and iECL immunoassay for cardiac marker Trop I, were ordered to carry out urgent analyses. By 2015-2016, we received additional chemistry analyzers, and by 2017 we got another electrolyte and iECL immunoassay analyzers. *Results:* We have allocated TAT within one hr for years 2015-2016, within 50 to 45 minutes 2017-2018 and within 30 minutes 2019. Because of strategic procurements of analyzers Cobas c501 (Roche, Basil) for routine chemistries, Nova 8 CRT (Nove biomedical, USA) for electrolytes and Cobas e411 (Roche, Basil) for Troponin I, we progressed to 2018 and beyond and was able to achieve our planned targets of effective TAT. As we prospered, we also procured additional instruments which made our tasks and plans achievable upto less than 30 minutes reporting time in year starting 2019. *Conclusion:* Around 150% to 200% improvement was noted in TAT of AED chemistry. Efficient TAT and accurate analysis of samples and availability of results facilitates shortening of patients' stay at hospital, thus cutting their expenses and exposure to nosocomial infections and ultimately providing best level key performance indicator (KPIs) for the institute.

Keywords Adsorption, heavy metals, organic dyes, takaout plant

Introduction

Turn around time or TAT is a terminology used to define reporting of a sample sent to clinical laboratory for analysis. Definition of TAT could be sample sent from ward till report out from lab, sample received on dispatching lab counter till reporting from respective lab or sample received in respective clinical labs section and reports availability. Generally accepted definition is basically the last one, which is time of receiving of whatever samples

within the respective specialty of lab till results availability either hardcopy or online as per designated TAT. The reason for significance of this TAT is essentially the dependence of clinical decisions on lab results, thus every lab should have a TAT with preferred accuracy and precision [1-4]. Moreover, early diagnosis and treatment of patients, through availability of timely, well precise and quality assured lab reports is becoming one of the key performance index (KPI) of any medical service [1,5-7]. Furthermore, better TAT and accurate analysis of samples and availability of results also helps in shortening of patients' stay at hospital, thus cutting their expenses and exposure to nosocomial infections [8]. Similar scenario can also be foreseen for emergency department where pre-analytical errors overcrowding, longer stay, delay in treatments and admission, because of delayed lab results, can cause overburden, avoidable medical errors, drastic untoward clinical consequence and outcome [4-7].

Therefore present study described trend analysis of TAT for our emergency profile tests of last five years (2019-2015), based and established on pattern, requirements and requests generated by our AED (accident and emergency department) between 2009-2014.

Materials and Methods

Our chemistry profile for Accident and Emergency department (AED) generally includes, urea, creatinine, electrolytes, Troponin I, Liver function tests, calcium, magnesium and phosphorous. Some times, additional parameters, such as protein AG ratio, Lipid profile, iron profile, cardiac enzymes were also requested. However, we profiled and studied Turn around Time (TAT) for generally requested parameters. Starting from 2014 Dec, we decided to accelerate our analytical efficiency to facilitate AED, by providing urea, creatinine, electrolytes, Troponin I, Liver function tests, calcium, magnesium and phosphorous results within 1 hour (60 minutes) and then gradually go down to within half hour (25 minutes) over a period of 5 years. To achieve our target, we dedicated our staff to perform (analyzed) and report AED requests as per designated TAT. Moreover additional analyzers, routine chemistry, electrolytes and iECL immunoassay for cardiac marker Trop I, were ordered to carry out urgent analyses. By 2015-2016, we received additional chemistry analyzers, and by 2017 we got another electrolyte and iECL immunoassay analyzers. By availability of additional reinforcement of analyzers, we partially dedicated these, one in each set, of analyzers to conduct analyses of AED profile and report within one hr 2015-2016, within 50 to 45 minutes 2017-2018 and within 30 minutes 2019. Analyzers were Cobas c501 (Roche, Basil) for routine chemistries, Nova 8 CRT (Nove biomedical, USA) for electrolytes and Cobas e411 (Roche, Basil) for Troponin I. As we progressed to 2018 and beyond, we also got hold of additional instruments which made our tasks and plans achievable upto less than 30 minutes reporting time. We has been receiving around 100 to 150 patients' samples 24/7 from AED which sometimes goes upto 200 depending upon season and/or any emergency situation in the city. Ours is a 700 plus bedded tertiary care hospital, with 35 specialties of medicine, surgery and allied and Diagnostics and located in the center of the city. Our TAT is defined as whatever samples received within our lab till results availability either hardcopy or online as per designated TAT.

Results

Results are summarized in Fig 1 to 5. January to December in all five years peaks and valley pattern was noted with less than 2 to 3 minutes variations. In earlier years, one or two months showed outlier of around 1 to 2 minutes, reason was Hemolyzed or insufficient sampling, or patient data incomplete.

Electrolytes were the 1st panel to be finalized within 15 minutes, followed by urea, creatinine and Troponin I within 30 minutes and reported. Liver function tests, Calcium, phosphorus and magnesium were with timeline of 20 to 25 minutes. We have allocated TAT within one hr for years 2015-2016, within 50 to 45 minutes 2017-2018 and within 30 minutes 2019. Because of strategic procurements of analyzers Cobas c501 (Roche, Basil) for routine chemistries, Nova 8 CRT (Nove biomedical, USA) for electrolytes and Cobas e411 (Roche, Basil) for Troponin I, we progressed to 2018 and beyond and was able to achieve our planned targets of effective TAT. As we prospered, we also procured additional instruments which made our tasks and plans achievable upto less than 30 minutes reporting time in year starting 2019.

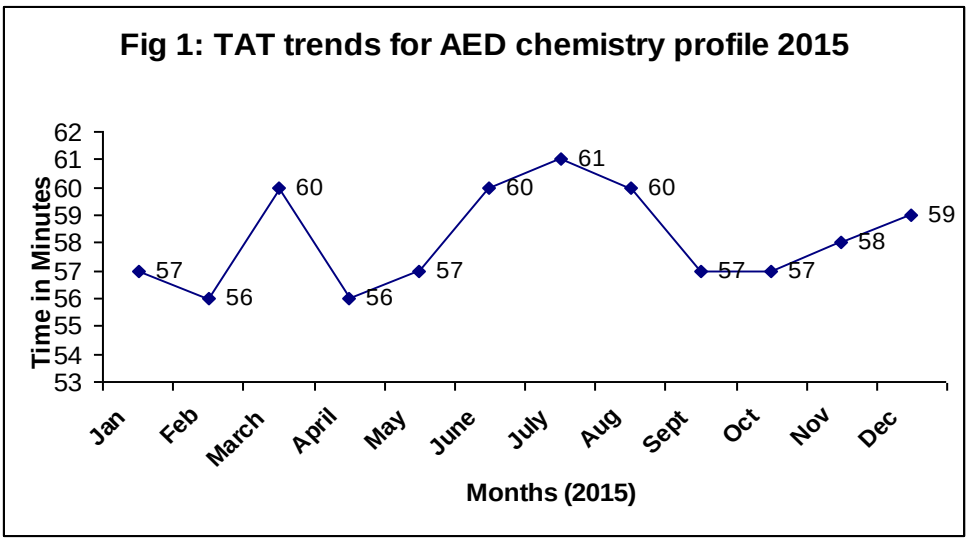
Fig 1: TAT trends for AED chemistry profile 2015
Time in Minutes
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Months (2015)

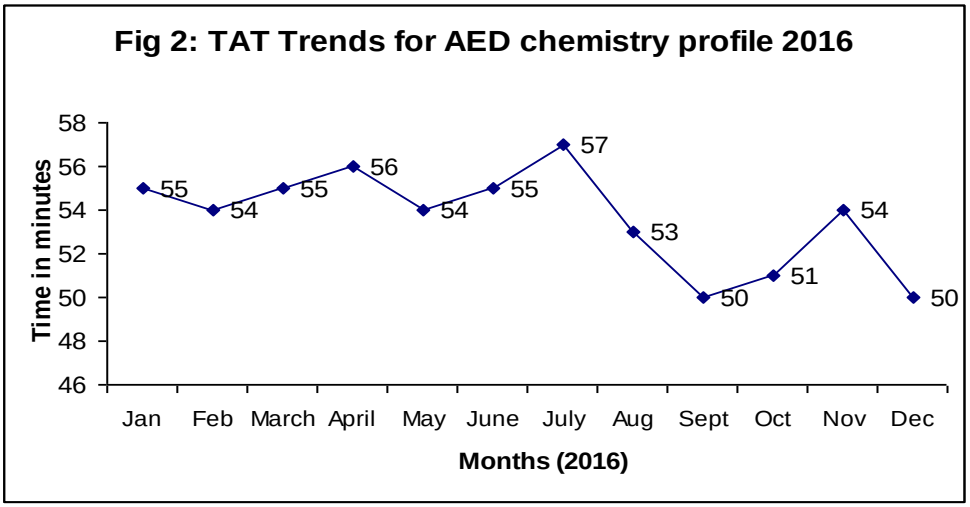
Fig 2: TAT Trends for AED chemistry profile 2016
Time in minutes
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Nov
Dec
Months (2016)

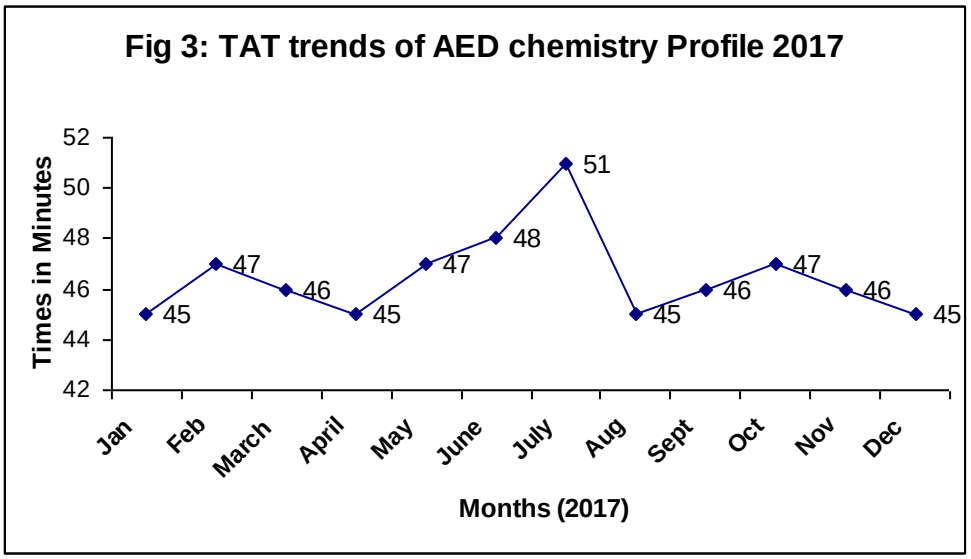
Fig 3: TAT trends of AED chemistry Profile 2017
Times in Minutes
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July
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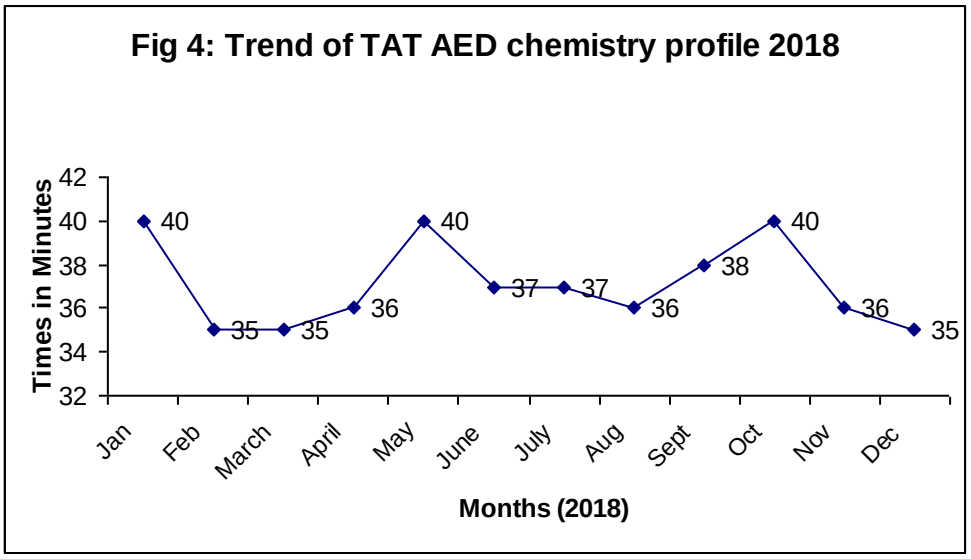
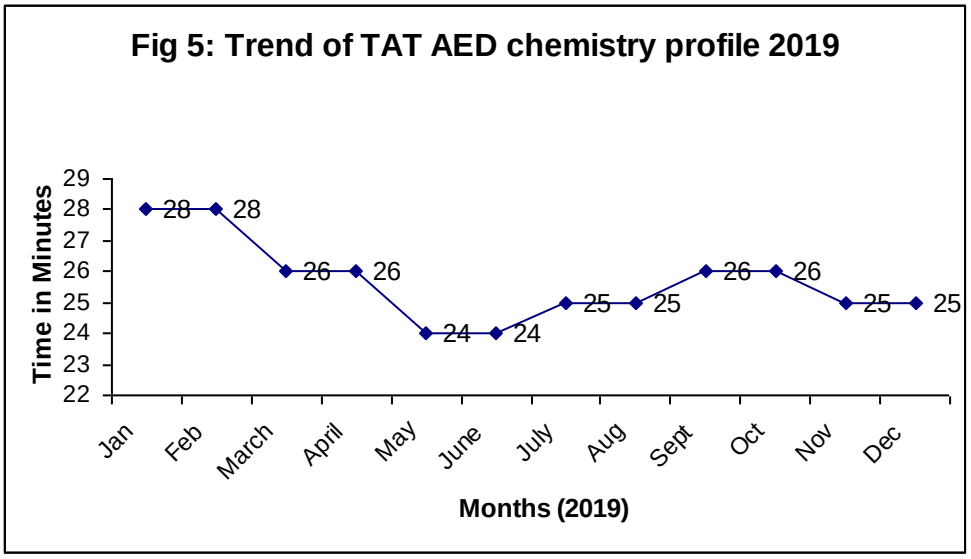
Months (2017)





Discussion

Waiting for a longer period of time for availability of lab reports, whether by patients or clinicians is disappointing and creates sense of distrust and doubt [1,9-11]. Mostly, in tertiary care laboratories, designated timeline or TAT, whenever surpassed, was due to sharp and heightened quality assurance steps and measures [1,12]. However, in generalized labs, meeting TAT is always an uphill task due to various factors, such as untrained staff, staff shortage, unavailability of ample number analyzers, pre-analytical delays etc [1-4]. In our current study, we reported improvement of TAT for AED chemistry profile, that had reporting timeline of one hour (less than or equal to 60 minutes) in 2015 goes down to less than 30 minutes in 2019. Our chemistry profile is composed of urea, creatinine, electrolytes, Troponin I, Liver function tests, calcium, magnesium and phosphorous. Our TAT is defined "samples as request of above mentioned tests received within our lab till results availability either hardcopy or online as per designated TAT", which is universally accepted definition.

In a recently published study, around 36% stat reports exceed their designated TAT, while 7% of routine chemistry reports were out of defined TAT [1]. Moreover, reason behind these delays (which cumulatively became 75%) were various extra analytical steps taken such as reruns, QA procedures etc, where as 48% was due to financial/cash

errors or requirements. There is a terminology known as Total/therapeutic TAT which is often used by physicians, that means time between request generation to diagnostic and/or therapeutic decisions [11,13], where as Lab professionals defined TAT as sample arrival to analysis and reporting. Confinement of TAT to above mentioned criteria is due to unavoidable, uncontrollable pre-analytical, outside lab factors that cannot be restricted by clinical laboratories. Punctually of lab services is often defines a hospital category as well, thus affixing to a designated TAT is always is in best interest of the institute and labs.

Billing to reporting and sample collection to reporting are two different scenarios, however, patients and physicians, both starts counting TAT from both perspective [14]. A previously published research project studied various pattern to TAT for different departments and noted that TAT for Out door patients (OPDs) and AED was significantly better, more efficient than wards [14]. Dissimilarity also noted in TAT, which was slower for night as compared TAT in mornings. Conclusion was drawn that billing, cash issues and some prioritized departments such as AED, occasionally responsible for devoid of uniformity in providing consistent TAT to all Wards, OPDs etc and thus creates disputation among physicians and patients.

As reported earlier, pre-analytical phase is mainly responsible for delays in analytical phase and deviations in subsequent reporting [1-4, 15]. Improvement in or avoiding Pre-analytical errors, which includes incorrect sampling, patient names, test requests, billing information, which consequently result in late TAT, is basically need of time as critical medical decisions dependent on lab results. Training of staff responsible for management of pre-analytical phase, in addition to staff designated for analytical steps, are two major factors that can easily improve TAT [8, 15]. In a study reported earlier focused on AED TAT and training of nursing and ancillary staff, resulting in notable enhancement in efficiency [15]. In our report as well, staff training and designated duty for TAT, resulted into progression of TAT from 60 minutes to less than 30 minutes for around 15 parametric chemistry tests.

Conclusion

Trend analysis of TAT for our emergency profile tests of last five years (2019-2015), was assessed in this report, based and established on pattern, requirements and requests generated by our AED (accident and emergency department) between 2009-2014. Around 150% to 200% improvement was noted in TAT of AED chemistry profile as time line enhanced from 60 minutes to less than 30 minutes within five years.

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