Evaluating The Efficacy of New Laboratory Information System in Turn Around Time (Tat) For Oral Biopsies

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Abstract

Background : Due to its importance for the standard of patient care, turn around time (TAT) analysis is becoming more relevant in clinical laboratories. TAT includes all of the procedures that take place in the laboratory. The TAT for analyses might be impacted by implementation of laboratory information systems (LIS) and changes in LIS can also affect TAT.

Aim: The aim of the study is to evaluate and compare the TAT in using different LIS software - RMS and DIAS and to correlate them with the different types of biopsies.

Material and methods : All samples that were received by the Department of Oral and Maxillofacial Pathology between April 2020 and April 2022 were taken into consideration. The data of receipt date and reported date of previous reports were included for determination of TAT. The types of samples included cytology, frozen sections, incisional biopsies, and excisional biopsies.

Results : The number of reported cases with the usage of the old LIS (RMS) is 855 and in the new LIS (DIAS) is 909. The mean TAT of incisional biopsy, excisional biopsy, frozen sections, and cytology samples for the DIAS reduced significantly when compared to the mean value of the TAT in RMS. The mean difference in TAT is about 1 day for incisional biopsy and excisional biopsy is about 2 days.

Conclusion :The overall mean TAT improved with DIAS when compared to the RMS. Collective efforts to improve the TAT for various specimens are essential for better laboratory performance in the future.

Keywords: laboratory information systems, turn around time, TAT, oral biopsies

DOI: 10.47750/pnr.2022.13.S04.135

INTRODUCTION

Clinicians and their patients demand not only accurate but also rapid surgical pathology reports whenever doctors perform a biopsy on a patient(1). The time between receiving a sample in the laboratory and the report being ready for collection/dispatch is known as laboratory TAT (LTAT) in the hospital. TAT is a critical indicator of laboratory performance. 7 - 14 days delay in issuance of reports contributes to prolonged patient treatment, waiting time, decreases satisfaction, and increases hospital costs.

System delays associated with obtaining, processing, and reporting analyzed samples have been recorded in pathology practice in underdeveloped nations. TAT is also utilized as a quality indicator in laboratory medicine, where it can aid in the evaluation of lab quality. TAT comprises three steps in general: pre-analytical, analytical, and post-analytical.(2)

According to the literature, most laboratories define TAT as the time between receiving a sample in the laboratory and the time when the results are reported (analytical phase). The majority of doctors, however, view it as the time it takes from ordering a test to receiving its results (total TAT, which includes pre-analytical, post-analytical, and analytical phases). (3–5)

The laboratory information system (LIS), which is responsible for the utilization and archiving of laboratory test findings, is a critical component of clinical laboratories' operations.(6) Implementing LIS in clinical laboratories enhances analytical TAT. Furthermore, the LIS helps to improve the TAT and overall quality of healthcare by allowing communication between the

analyzers and the hospital information system, which improves the quality of the results and reduces human errors (7). It can help to improve the TAT's post-analytical phase as well.(8) Studies have shown a substantial positive relationship between the availability of a LIS in a hospital and its income.(8)

Numerous studies have assessed the analytical TAT of their present LIS.(2)(3)(5). The data on analytical TATs of several test panels were studied before and after the introduction of the new LIS. Lowe, Griffin, and Hart found that there was no substantial difference between their old and new healthcare information systems for analyzing their test panels. (9)

Many researchers have attempted to assess analytical TAT, despite the fact that each hospital is unique in terms of LIS, apparatus, settings, workflow, patients, and so on. Furthermore, different research employs various tests.

LIS/Patient management/Hospital management software were introduced and customized by Dr. Deepak Nallasamy to improve patient satisfaction, standardize treatment quality and comprehensive hospital management in Saveetha Dental College. The patient and doctors feedback were utilized to continuously review the system and improve the shortcomings.

RMS (Old LIS)

RMS is an electronic health record (EHR) and dental practice management system for small, midsize, and large dental practices, as well as for specialists like periodontists, endodontists, orthodontists, and oral surgeons. Dental professionals can send patients to specialists and keep track of communications by using the RMS, a collaboration tool. Its shortcoming was that individual patient samples could not be tracked.

DIAS (New LIS)

Primary features of DIAS include patient engagement, medical history, treatment plan management, patient referral, appointment management, invoicing, file cabinet, and financial reporting. The patient engagement feature provides the medical history that helps track medical alerts, pre-medication, and allergy details. The new system DIAS provides a proper tracking of the specimen and the clinical details are easily available in this system, making it easier for the pathologist to provide a diagnosis correlating the clinical features.

With valuable inputs from staff members of the Department of Oral Pathology, SIMATS, the new layout for DIAS was prepared and administered to improve the overall quality of reporting. To the best of our knowledge, there are no previous studies to evaluate the efficiency of two different LIS within the same hospital. Hence, this study was conducted at Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Chennai which had utilized the RMS program till April 2021 and migrated to DIAS program in May 2021.

Materials and Methods

All specimens received by the Department of Oral and Maxillofacial Pathology between April 2020 and April 2022 were considered for this study. The previous digital reports were retrieved from the archival data. It was utilized for extraction of TAT for individual patient samples. The samples consisted of incisional biopsies, excisional biopsies, frozen sections, and cytology. Diagnostic research and specimens that were referred for a second opinion were excluded from the study. Specimens sent for routine pathological review from other external centers were also excluded. The administration has granted authorization to analyze this acquired data after removal of all patient identifiers to ensure that security and confidentiality are not jeopardized. Because the entire target population was included in the study, the danger of sampling bias was avoided.

Reports which have been reported with RMS and those reported under DIAS were grouped separately. The TAT (in days) taken for each type of biopsy was calculated and their percentages were calculated separately. It included incisional biopsies, excisional biopsies, frozen sections and cytology samples. TAT was entered into excel sheets. The data obtained were analyzed using Statistical Package for the Social Sciences (SPSS) software v25.0.

Results

The analytical TAT data of the biopsy were collected for 24 months in total. The number of extracted records was grouped separately as incisional, excisional, frozen, and cytology.

The number of reported cases with the usage of the old LIS(RMS) was 855 and in the new LIS (DIAS) was 909. The data was

uploaded in an excel sheet and statistics were done using SPSS software v25.0.

Among the reported cases, RMS showed 50% (421) cases of incisional biopsy, 36% (300) cases of excisional biopsy, 9%(77) cases of frozen specimens, and 6%(57) cases were cytology. The extracted data from the DIAS showed 53%(482) cases of incisional biopsy, 33%(304) cases of excisional biopsy, 8% (65) of frozen biopsy and 5% (58) cases of cytology.

Comparative analysis was done using Independent t tests for RMS and DIAS. It was statistically significant with p value of 0.02.

The TAT means of RMS were incisional biopsy - 4.0 days (p value - 0.041), excisional biopsy - 9.7days (p value - 0.0332) , frozen sections - 1.5 days (p value -0.023), and cytology - 1.3 days (p value - 0.078) respectively. The means of DIAS for incisional biopsy - 3.0 days (p value - 0.021), excisional biopsy 7.4 days (p value - 0.098), frozen sections 1.2 days (p value - 0.043) and cytology was 1.1 days (p value - 0.034) (Table1).

All the mean values showed significant p values except the excisional biopsy of the DIAS and the frozen biopsies of the RMS showed insignificant p values of 0.98 and 0.78 respectively.

The percentage of incisional biopsies reported within 3 days was 76.3% of RMS and 86.3% of DIAS respectively. The percentage of excisional biopsies reported within 7 days showed no significant difference in both systems. Comparatively cytology and frozen sections showed significant improvement of the TAT with DIAS software about 97.5% and 87.5% respectively.

Table 1

	t	df	P value	Mean difference	Upper	Lower
INCISONAL – DIAS	72.946	481	.021	3.046	3.74	3.95
INCISONAL RMS	74.395	420	.041	4.076	3.97	4.18
EXCISIONAL – DIAS	34.344	303	.098	7.477	7.05	7.91
EXCISIONAL - RMS	46.204	299	.0332	9.687	9.27	10.10
CYTOLOGY – DIAS	24.913	76	.043	1.273	1.17	1.37
CYTOLOGY RMS	15.801	56	.023	1.517	1.32	1.71
FROZEN SECTION - DIAS	25.567	73	.034	1.135	1.05	1.22
FROZEN SECTION -RMS	24.688	76	.078	1.312	1.21	1.42

Table 2

	N	MEAN	STD.DEVIATION
INCISONAL – DIAS	482	3.85	1.158
INCISIONAL RMS	421	4.03	1.211
EXCISIONAL – DIAS	304	7.48	3.42
EXCISIONAL RMS	300	9.69	3.61
CYTOLOGY –DIAS	58	1.52	.731
CYTOLOGY-RMS	77	0.731	.448
FROZEN SECTION - DIAS	65	1.14	0.44
FROZEN SECTION - RMS	57	1.31	0.53

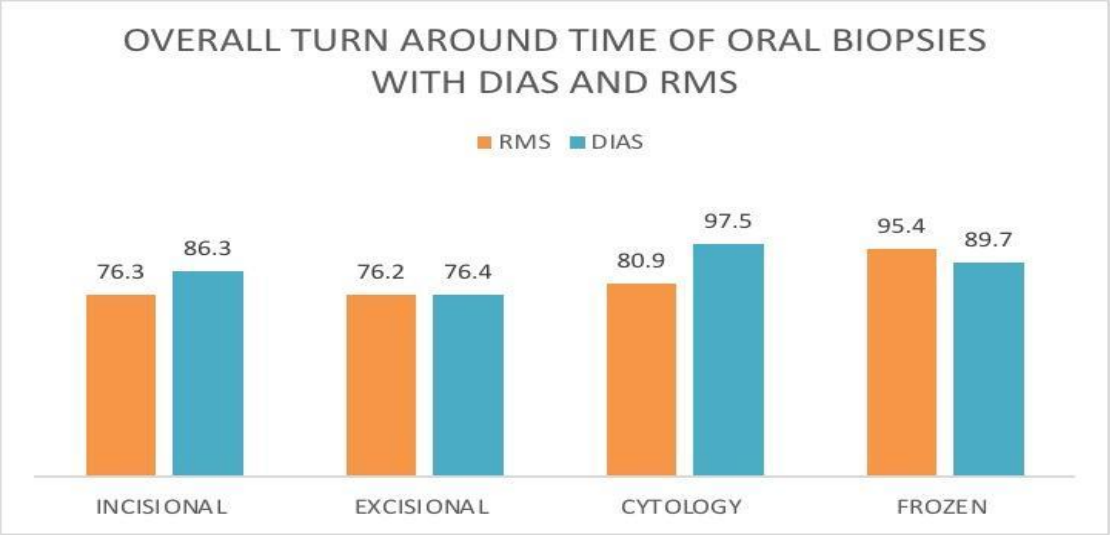

Figure 1: indicates the percentage of the overall TAT of oral biopsies with the usage of RMS and DIAS software.

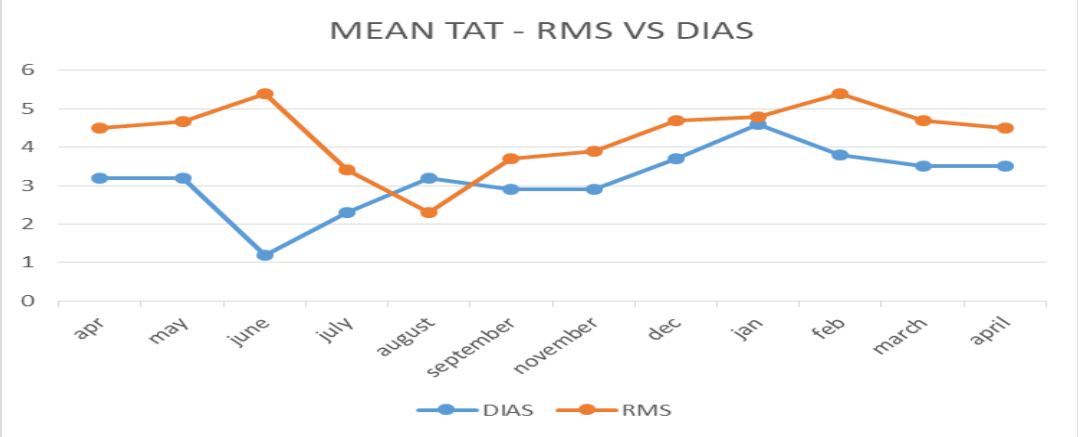

Figure 2: indicates the line graph representing the significant difference in overall mean TAT of oral biopsies of both systems

Discussion

DIAS had enhanced functionality and applications than RMS.

A key element of quality assurance in the laboratory is Turn around Time (TAT). The study showed that there is a statistically significant difference between the mean TAT of the RMS and DIAS software (p value < 0.01) for all the biopsies. The improvement in the mean value of the TAT is about 1 day for incisional biopsies and 2 days for excisional biopsies by using DIAS software when compared to the RMS software. Thus, the new software provides the different functionality and application which was not there in old software. These new functionality may have helped the pathologist to utilize their work on time.

There are not enough studies about the improvement in the analytical TAT after converting from one software to another in oral biopsies. However, the study that has been done by Zawawi et al in the hematology department showed that their analytical TAT showed significant improvement after implementing their new LIS.(2) Our study showed similar results that the new LIS has significantly improved the analytical TAT for all the biopsies received. The improvement was about 1 day for incisional biopsies and 2 days for excisional biopsies.

If one of the aims for switching to a new LIS was to improve the analytical TAT, then this information is crucial for the laboratory management. The percentage of improvement must be taken into account, if the objective was to be attained in order to determine whether or not it was successful.

Another study by Lowe et al concluded that the increase in analytical TAT in the first five months following the implementation of their new LIS, has a number of causes. One of the causes was that the staff had to work manually utilizing a paper-based system because their new LIS had to be reset numerous times for corrections and other issues. The laboratory personnel also found the new LIS to be difficult and it took them a long time to get used to it. Another problem was that lab requests were not filed in the proper order, which forced the laboratory staff to get in touch with the surgeon to get the needed details.

Our study results are not in concordance with the previous literature indicating that the new LIS has more functionality when compared to the older LIS.One of the major advantage of using the new LIS (DIAS) the clinical details will be provided as a request and the analytical TAT includes from the time of the request submitted. This means that the staff were adequately trained, and this increase occurred because they were adapted to the new LIS.

The clinical laboratory of Prijatelj improved their analytical TAT by 25% and were able to treat all of their tests as STAT tests after switching from a manual, paper-based system to a LIS [15]. According to this study, switching from an old LIS to a new LIS extended the laboratory's mean analytical TAT for the various kinds of oral biopsies. Additionally, the wait for deeper portions and certain stains may be a factor in the longer TAT in the index research. There is room for improvement in this area, and reminding residents and consultants who handle specimens on a regular basis could hasten reporting.

About 87.5% and 78.4% of the incisional biopsies were reported in 3days with DIAS and RMS software respectively. There is significant improvement in reporting of incisional biopsies using DIAS software. This delay in RMS TAT can be due to the cases that had no clinical information on a requisition slip with lack of history that did hinder diagnosis wherein DIAS provided the proper information through biopsy request which improved the TAT.

Possible solutions for the increased TAT include adopting a stringent monitoring procedure to make sure that sample processing doesn't take longer than the ideal TAT, increasing the use of automated procedures, and paying closer attention to nonconforming occurrences like requests for recuts or deeper sections. This study found a tendency for TATs to increase for small, moderate, and large samples, in that order, indicating that sample size might affect TATs.

The limitation of the study includes that only mean value analysis was done, further statistical analysis can provide better results.

Of the many sections only the oral biopsies section were included in the study.The other areas can also be the subject of similar research. The applications and features of the new LIS can also be evaluated to determine their precise impact on the analytical TAT of the various Laboratory sections. Additionally, other TAT phases, such as the pre- and post-analytical TAT, can also be explored.

Conclusion

From our study, we can conclude that the new LIS showed significant improvement in the TAT of oral biopsies. However, frozen sections did not have a significant change in both systems.

Acknowledgement

The authors would like to acknowledge the help and support rendered by the department of oral pathology and the information technology team and management of Saveetha dental college for their constant assistance with the research.

Conflict of interest

None

Funding

This research did not receive any specific grant from funding agencies in public, commercial or not-for-profit sectors.

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