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Annual audit of haematology tests performed at a laboratory of a tertiary teaching hospital in Dar es salaam Tanzania

*Mawalla, WF[1], Ally R[2], Nyamahanga I[2], Shija E[2] Mtaki M[2], Mtali Y[1], Makongoro M[1], Mgaya J[1], Christopher H[1], Chamba C[1], Tluway F[1], Makani J[1]

[1]Muhimbili University of Health and Allied Sciences (MUHAS), Department of Haematology
[2]MUHAS Academic Medical Centre (MAMC), Department of Haematology and Blood Transfusion

***Corresponding author:**

William F. Mawalla

Mail: wmawalla@blood.ac.tz.

Phone: +255 65 787 9109

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Abstract

Background
Monitoring of laboratory performance is crucial as it plays a central role in diagnosis, management and clinical decision making. With commencement of haematology clinical and laboratory services at the MUHAS Academic Medical Centre (MAMC); smooth ordering, handling and transfer of specimen and timely return of results can be challenging. We aimed to assess the function and efficacy of haematology clinics and evaluate the capacity of MAMC laboratory in performing tests ordered from the haematology clinics, as established by hospital guidelines.

Methodology
This was a retrospective descriptive study conducted from 1st of January to 31st March, 2018 in MAMC in Dar es Salaam, Tanzania. The study involved the Haematology and Blood Transfusion outpatient clinic department and laboratory section. Analytical and post-analytical phases of laboratory functions were measured against established standards stipulated under MAMC specialized clinic and laboratory services guidelines.

Results
A total of 53 patients attended the weekly haematology clinics. None had Haemoglobin (Hb) or Complete Blood Count (CBC) results available before doctor's consultation. 75 different haematological tests were ordered. 81.3% of orders were collected and only 21.3% of the collected have results available in the Hospital Information System (HIS). Sickle Cell Disease (SCD) tests are not performed at MAMC. Half of the hemoglobin results (Hb) and two-third of the complete blood count results (CBC) were under the Turnaround Time (TAT) from time of sample collection to results, respectively. The number is lower when taken from the time of test order.

Conclusion
The weekly haematology clinics at MAMC operate below the standards set by the hospital. This is significantly contributed by laboratory performance. The capacity and operation of the MAMC laboratory is still below set standards, both in terms of number of haematological tests it performs and attainment of set TAT. Reporting of results to the HIS is also not fully implemented.

Keywords: Audit, Haematology, Sickle Cell Disease, Turnaround Time, Hospital Information System, Outpatient Department, Clinics, Haemoglobin, Complete Blood Count

Background

A clinical audit is a systematic review of care against explicit criteria (established standards) and the implementation of change with aim of improving an institution's clinical operations and patient's care [1]. Selected aspects of structure, processes and clinical functions are systematically observed to measure their alignment to set standards and guidelines. Clinical audits serve as a system of checks-and-balance for healthcare institutions and organizations and are important tools in ensuring sustainable quality healthcare [2].

Laboratory based audit is a systematic review of day to day laboratory operations against established laboratory practice guidelines. Monitoring of laboratory performance is crucial as it plays a central role in diagnosis, management and clinical decision making. Laboratories have been reported to influence about 70% of medical diagnoses [3]. Laboratory operations and areas of audit can be divided into pre-analytical, analytical and post-analytical phases. Pre-analytical audit involves assessment of request forms, specimen order together with phlebotomy services and transport. Analytical audit focuses on the operations taking place inside the laboratory during analysis of specimens. It ranges from availability of investigations, test methods, safety policies and procedures to laboratory reports and storage of reagents and specimens. Post-analytical audit assesses TAT, reporting methods, reference ranges, interpretation, consultation and comments on reports, together with complaints and corrective action taken [4]. While the pre-analytical phase of testing cycle can easily be pointed out as not taking place inside the 'walls' of a laboratory it may account up to 68% of all the laboratory errors [5].

While there is a paucity of published internal audits, especially in blood transfusion and laboratory haematology practices in Tanzania [6]; clinical audits as a key element of clinical governance can aid in monitoring of established standards to new healthcare facilities and laboratory units [7]. With commencement of haematology clinical and laboratory services at the Muhimbili University of Health and Allied Sciences Academic Medical Centre(MAMC); smooth ordering, handling and transfer

of patients test samples, and timely return of results can be challenging. This is especially true as all the involved departments and staff are adjusting to the new facility and logistical systems.

Availability of haematological tests and timely return of results during the weekly clinics in the first quarter at MAMC was faced with challenges and inconveniences to both clinicians and patients. This study is expected to commence an audit cycle that will inform status of adherence to guidelines, identify implementation barriers and obstacles and set plans for a continuous system of interventions and monitoring [8, 9], which will in turn result in standardized patient care.

Methods

Study Area

The study was conducted from 1st of January to 31st March, 2018 in MAMC in Dar es Salaam, Tanzania. The study involved the Haematology and Blood Transfusion outpatient clinic department and laboratory section. MAMC is a specialized academic and medical center receiving patients from regional and other referral hospitals across the country. The new facility commenced clinical operations in September, 2017.

Study design and sample size

This was a retrospective descriptive study aimed at assessing the function and efficacy of haematology clinics and to evaluate the capacity of MAMC laboratory in performing tests ordered during the haematology clinics. These aspects (analytical and post analytical) were measured against established standards stipulated under MAMC specialized clinic and laboratory services guidelines. All patients who attended the two clinics were included for assessing the function and efficacy of haematology clinics. Evaluation of MAMC laboratory capacity included patients who attended the two clinics and had haematological tests ordered.

Data Collection

A retrospective search was made through the Hospital Information System (Acron HIS) for all patients who attended sickle cell and general haematology clinic at

MAMC from 1st of January to 31st of March, 2018 and data filled in special case report forms.

All patients who attended the two clinics were included for objective 1. Objective 2 included patients who attended the two clinics and had haematological tests ordered. Data for samples ordered and transferred to other MUHAS laboratories outside MAMC was gathered from the sample dispatch forms available at MAMC laboratory.

Results

Availability of patient's basic blood tests prior to doctor's consultation during clinics from 1st January to 31st March

At total of 53 patients attended the two clinics; with 41 patients and 12 patients seen at the sickle cell and general haematology clinics, respectively.

None of the patients had Hb or CBC results available before walking - in the consultation room. (**Table 1**)

Table 1: Patients and Test Results before doctor's consultation

Clinic	Patients with results before doctor's consultation	Total Patients
Sickle Cell	0	41
General Haematology	0	12
TOTAL	**0**	**53**

Availability of patients results in the Hospital Information System (HIS)

Figure 1: Flow chart for reported results in HIS

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Total Patients seen

n=53

Total No. of Tests ordered

(Hb, CBC, PBS, Iron Studies, Reticulocyte count, Hb Electrophoresis, HPLC, Blood typing)

n= 75

No. of Tests collected

n= 61 (81.3%)

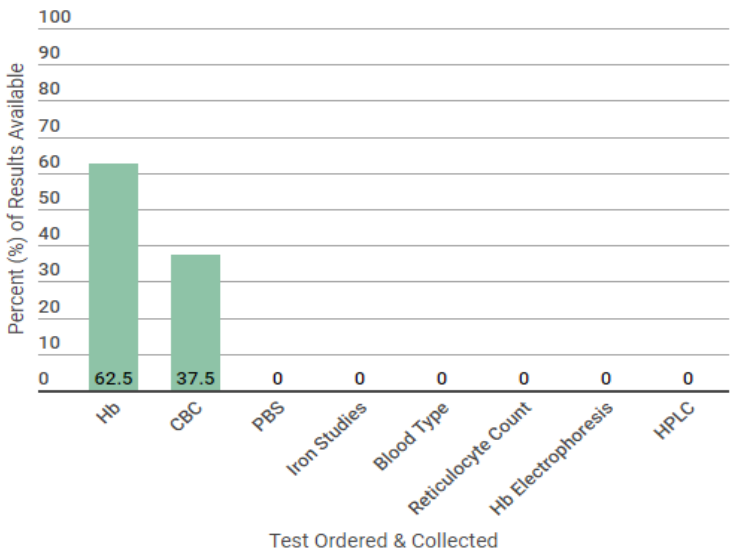
No. of Tests reported in HIS

n=16 (21.3%)

Key: *Hb: Haemoglobin CBC: Complete Blood Count PBS: Peripheral Blood Smear HPLC: High Performance Liquid Chromatography*

The types of tests that are available at the HIS are Hb and CBC only. 62.5% (10) of results are for Hb. (**Figure 2**)

Figure 2: Test Results available in the HIS



The Capacity of MAMC Laboratory

Availability of haematological tests across various MUHAS Laboratories from 1st January to 31st March

For sickle cell disease (SCD) tests; only the HCRL can perform all tests, while only two, sickling and Hb Electrophoresis are being done at MNH. None of SCD test is performed at MAMC. Other hematological tests are being performed at all three laboratories except for reticulocyte count and iron studies. Reticulocyte count is performed at HCRL and MNH, while iron studies are only done at MNH laboratory. (**Table 2**)

Table 2: Haematological tests at various MUHAS Laboratories

Type of Test		MUHAS Laboratory		
		MAMC	HCRL	MNH
1.SCD Tests	Sickling test	x	✓	✓
	IEF	x	✓	x
	HPLC	x	✓	x
	Hb Electrophoresis	x	✓	✓
2.Haematology analyser	Hb	✓	✓	✓
	CBC	✓	✓	✓
4.Reticulocyte count		x	✓	✓
3.Peripheral Smear		✓	✓	✓
4.Blood Grouping		✓	✓	✓
5.Iron Studies		x	x	✓
6.Coombs Test		✓	✓	✓

Key: CBC: *Complete Blood Count* Hb: *Haemoglobin* MNH: *Muhimbili National Hospital*
HCRL: *Haematology Clinical Research Laboratory* ✓ : *Available* x : *Not Available*

Out of 75 tests ordered, only 44% (33) have traceable laboratory of processing. Half (51.5%) of traceable samples were processed at MAMC. 36.4% (12) of the remaining were processed at HCRL, and 12.1% (4) at MNH. (**Table 3**)

Table 3: MUHAS labs used to process ordered samples

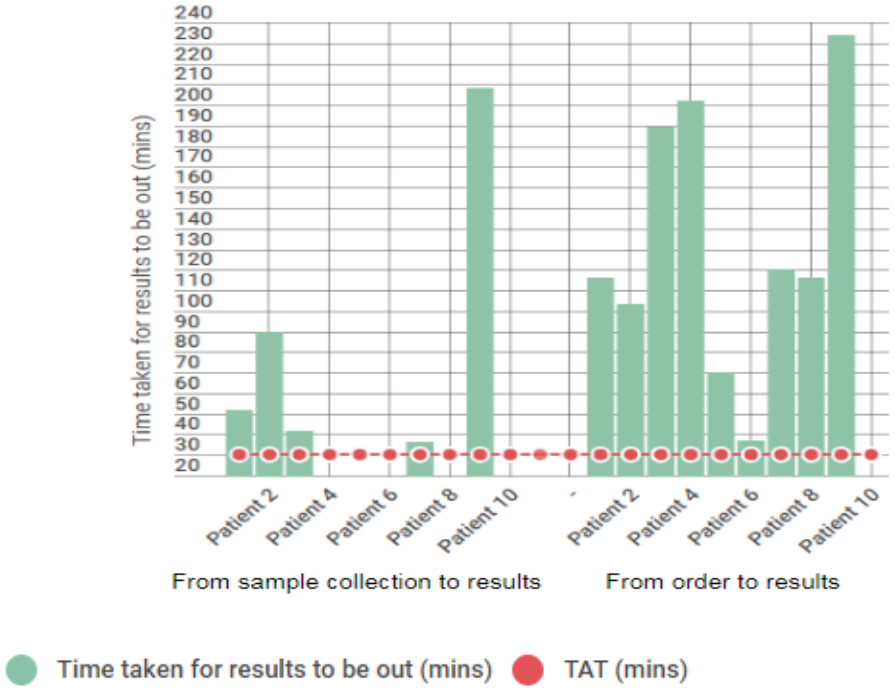
Type of Test	MUHAS Laboratories		
	MAMC	HCRL	MNH
Haemoglobin level	10	0	0
CBC	6	1	1
Reticulocyte count	0	1	0
Peripheral smear	0	0	0
Blood Typing	1	0	0
Hb electrophoresis	0	0	3
HPLC	0	10	0
TOTAL	**17**	**12**	**4**

Key: CBC: *Complete Blood Count* Hb: *Haemoglobin* HPLC: *High Performance Liquid Chromatography*

Time taken for routine haematological test results to be out

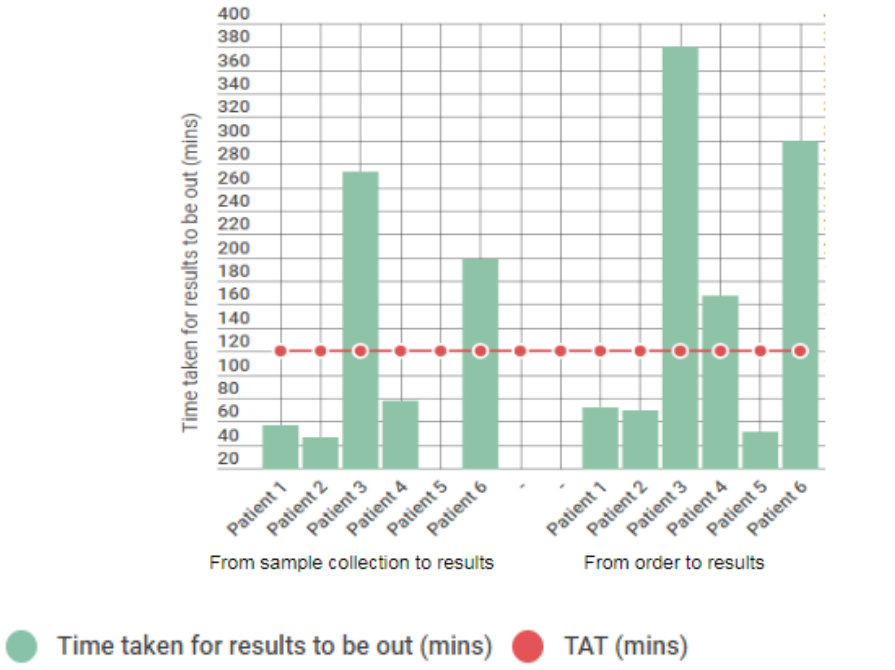
For the Hb test, which has a set TAT of 30 minutes; only half of the results were under TAT from time of collection of samples to results confirmation. However, only one sample was under TAT when taken from the time of ordering to results confirmation. (**Figure 3**)

Figure 3: Time for Results to be out for Haemoglobin (Hb) test



For the CBC test, which has a TAT of 2hrs; two-third of the results was under the TAT from time of collection of sample to results confirmation. Half of the results were under TAT when taken from the time of ordering to results confirmation. (**Figure 4**)

Figure 4: Time for Results to be out for CBC test



Discussion

Unavailability of basic blood tests prior to patient's walk-in for consultation may be a result of lack of effective communication of the specialized clinic standard operating procedures (SOPs) to clinic nurses who receive incoming patients. This may be compounded with uncertainty regarding whether the nurses have access to order these tests through the HIS before consultation.

Inability of sample collection for some of the ordered tests may be due lack of payment for the ordered samples to some patients. Another likely reason is some patients might not report to the outpatient department (OPD) laboratory for sample withdraws after the clinics.

It's interesting that most of the samples that were collected but results are lacking are for tests that are not performed at MAMC yet. This reflects disarray in logistical arrangements and lack of proper documentation and follow-up of samples transferred outside MAMC.

The fact that MAMC does not perform any sickle cell disease test significantly impairs the operations of the weekly sickle cell clinic. It also increases delays in diagnosis, follow up and prompt management of patients. This applies to another important hematological test, the reticulocyte count.

Also, the point that only 44% of ordered tests have traceable laboratory of processing, hints back to improper documentation for samples that are sent outside MAMC for processing.

Fewer CBC results in the HIS may be contributed by the fact that the CBC machine is not integrated with the HIS, requiring scanning of the results before uploading to the system. This may cause some results to be left out without being scanned.

While significant proportion (50% and 33.3% for Hb and CBC, respectively) of results do not come out on time from time of sample collection; the case is worse if taken from the time when the samples were ordered. This unveils existence of a serious delay time from when tests are ordered to when they are collected. All samples are being collected at the OPD laboratory which also collects samples for all other OPD

sections and clinics. Delay may be a result of a low phlebotomist to patient ratio, overwhelming the current staff. Since samples collected from the OPD lab are sent to the central laboratory with a pneumatic sample transfer system, delay should not occur during this process.

Conclusion and Recommendations

The weekly sickle cell and general haematology clinics taking place at MAMC operate below the standards set by the department and hospital. This is significantly contributed by laboratory performance. Nurses at the clinic should make sure the incoming patients go for basic test before walking to the doctor's room. Documentation and logistical arrangements for all tests shipped outside MAMC laboratory should be strengthened, and the number of phlebotomists should be increased in the OPD laboratory. A focal person in the laboratory should be appointed who will ensure availability of results in the HIS in a timely manner.

Declaration

Acknowledgement

We would like to send our special thanks to MUHAS Deputy-Vice Chancellor-Hospital Services, Director of Clinical Support Services, Head of Department of Haematology and Blood Transfusion and MAMC laboratory Manager for granting us permission and providing support throughout the audit process. We also express sincere appreciations to all the MAMC laboratory personnel whom we have worked with closely throughout this project.

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