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PATIENTS' PERCEPTIONS ON FACILITATORS AND BARRIERS OF UTILIZATION OF CLINICAL LABORATORY SERVICES: SUGGESTIONS FOR PACIFIC NATIONS

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ABSTRACT:
Clinical laboratory is an essential department in the health facility in developing Pacific Island countries. Patient perception on services being provided by the clinical laboratory department is very important because laboratory results help in diagnosis of patient's conditions. In the developing Pacific Island countries, there is very less to no research done on the patient's perception on clinical laboratory services among patients. The aim of this study was to review patient's perception on the main factors affecting clinical laboratory services among patients and to provide a suggestion for Pacific countries. The literature search was done using Medline, Embase, Scopus, and Proquest databases, and relevant keywords were applied to find studies which have been conducted in the field of medical laboratory sciences specifically looking at patient's perception on utilization of laboratory services. All the studies pertaining to the topic, published between 2000 and 2020 in English language were reviewed and the main themes were identified. The results showed that patient's perceptions are primarily based on their experience with the three main cyclic phases of the clinical laboratory; these three phases are the Pre-analytical phase, Analytical phase and the Post-analytical phase and the way services are delivered in the clinical setting. The patients prefer the laboratory staff to display professionalism and have good communication and clinical skills. Negative perceptions arise mainly in terms of the turnaround time of test results, poor accessibility, incompetency of staff, unavailability of laboratory handbook and staff not being able to answer questions. This study concluded that there is a need to tailor interventions by considering the factors identified in this study that may be used to improve the clinical laboratory services among developing Pacific island countries.

Keywords: Patients' Perceptions, Clinical Laboratory Utilization, Facilitators, Barriers, Pacific

INTRODUCTION:

The clinical laboratory department is one of the most important departments in a health, facility; it helps physicians to come up with a definite diagnosis to a patient's condition. A Clinical guide for medical students in Aden University mentioned "The laboratory is an important part of medical diagnostic procedure", as it helps add objective patient information to subjective history and physical examination of patients [1]. Clinical laboratory testing has advanced over the years giving more definitive diagnosis and a faster turnaround time of lab based results. The clinical laboratory has various sections which look at different specimens which are sent in by the physicians and samples which are collected in the lab outpatient department for processing. Some common sections of the clinical laboratory are; Clinical Chemistry, Microbiology, Blood Bank, Hematology, Central Reception Area, Histology, Cytology and Serology. Physician send request for test to be done on the patient's blood, serum, plasma urine, stool, exudates, transudates, secretions, or other fluids [1].

The clinical laboratory setup follows a laboratory cycle, known as "laboratory testing cycle" [2]. It consists of all steps between the time when a clinician requests a laboratory test the time the sample is collected from the patient for testing and the results are returned to the clinician. A study done by Wians et al., [2] in Dallas states that the laboratory cycle consists of 3 phases: pre-analytic, analytic, and post-analytic [2]. In a clinical pathology laboratory, patients are the ultimate customers. However, physicians enjoy a preferred customer status, and their opinions are also an essential component in developing a customer-oriented laboratory [3]. In the United States (US), major agencies that accredit laboratories, require assessment of customer satisfaction as one of the components in accreditation [3].

Patients are very important and ensuring that their views and suggestions are considered and implemented is paramount. This is also stressed in a study done by Sajid et al., [4] in United Kingdom (UK) that mentioned the importance of a quality health care system to ensure continues care. Assessment of quality usually focuses on technical concerns including the process through which care is delivered; it becomes more precise when it is based on the application of standards integrating the patients' views, experiences and perceptions. Patient satisfaction is not just limited to the service, but to the many factors which equally contribute to the overall views of the patients [4]. Patient satisfaction is influenced by the quality of service and professionalism of the staff, provision of adequate information to collect specimen and when and how to receive laboratory results, waiting time to receive laboratory results, availability of ordered laboratory tests, cleanness of the laboratory room, location of

laboratory room, availability and accessibility of latrine [5].

There are tangible and intangible determinants of service quality. A research done in Turkey by Kara et al., [6] found that the relationship between quality of service and customer satisfaction is that all intangible factors associated with service quality turn out to be unequivocally more important than the tangible ones. In other words, intangible factors appear to play a statistically more significant role compared with tangible factors in determining the overall customer satisfaction and the quality of non-profit health-care services [6]. Developing nations are making every effort to provide their citizens to receive fundamental healthcare even with limited consumer resources and other health related resources.
A study done by Hussain et al., [7] in Pakistan sought to investigate how pharmacy services, laboratory services, doctor–patient communication, and physical facilities measured patient satisfaction alongside the quality of the hospital service. The authors concluded that all of these services played a vital role in determining the overall patient satisfaction. Furthermore, if one of the factors caused patient dissatisfaction than the overall satisfaction for the other services accessed by the patients would be reduced [7].

Similarly, in the Pacific the health care system has progressed over time from being a noble profession to being a customer-oriented service industry [8]. The contributing factors to this change are the availability of information through internet, higher expectations of patients, health insurance schemes, and advancement in medical technology [8]. This has resulted in delivering high quality of health care services; safe, equitable, evidence based, timely, efficient, and patient centred services [8]. Since limited research has been conducted to assess the factors affecting the utilization of laboratory services in the Pacific, this study aims to identify the factors causing facilitators and barriers of utilization on laboratory services and suggest further research in this area for the developing pacific island countries.

METHODOLOGY:

This review focused on several aspects related to patients' satisfaction, potential facilitators and barriers of utilizing of clinical laboratory services. Four databases were used to search for publications on relevant studies: Medline, Embase, Scopus, and ProQuest. The keywords used included: (Perceptions OR Belief OR Opinions) AND (Laboratory* OR "Clinical Laboratory") AND (Patients OR "Patient Satisfaction"), AND ("Laboratory Services" OR "Lab"). The focus of the search were studies published between 2000 and 2020 and in English language. The titles of all the studies were scanned by two independent researchers and those not relevant were excluded. The abstracts of the remaining studies were

reviewed and the full text of the 40 articles that met the study inclusion criteria were printed for future review and to formulate the themes that are discussed below.

RESULTS:

Table 1 shows the themes that were found in this study that determine the patient's perceptions on facilitators and barriers of utilization of clinical laboratory services.

Table 1: Themes and sub-themes

Themes	Sub-themes
Pre-analytical related factors	1. Incompetency and Knowledge 2. Patient Interactions and Availability of Laboratory Handbook 3. Laboratory infrastructure and Occupational Health and Safety (OHS)
Analytical related factors	1. Turn Around Time of Tests, Results Notification and Reporting 2. Laboratory Standards and Protocols 3. Sufficient Stocks and Availability of test
Post-analytical related factors	1. Results Reporting & Notification (Format & Accessibility) 2. Availability of Staff to answer question and waiting time

Theme 1- Pre-analytical related factors:

Pre-analytical phase is one of the most important phases of the three testing phases in the clinical laboratory [9]. Pre-analytical phase is the phase where all the laboratory based decisions are made and corrected to ensure that quality results are delivered to patients, this phase includes prescribing to testing, using the correct forms, collecting of samples and receiving of samples, patient identification, collection of the sample, handling of the sample, sorting out, pipetting of certain samples and centrifugation of some samples [9]. Negligence in any of these steps can lead to incorrect results in the pre-analytical phase [9]. The pre-analytical phase is crucial for analysis and is equally important as the other two phases [10].

The Clinical Laboratory Standards Institute (CLSI) and the Laboratory Quality Management System (LQMS) have set standards related to blood sampling and sample transportation and handling [10]. The compliance to these guidelines is low, especially in cases when blood is collected outside the laboratory. Samples with patient identity are swapped, samples reach the laboratory late, either samples are mixed or mislabelled [11]. Therefore, to achieve appropriate quality improvement and to reduce the burden of preventable errors, standardization of the pre-analytical procedures including patient preparation and identification,

sample collection, transport, handling, storage and preparation for testing should be enforced by the laboratory professionals outside the Laboratory [11]. Standardization of several pre-analytical activities can be achieved by major adherence to available guidelines, implementation of total quality management system that include pre-analytical requirements, as well as continuous education of the health staff with blood sampling responsibilities [11].

While analytical standards are developed, there is a gap in the development of standards for the pre-analytical phase. This phase is prone to errors the most as the steps involved are directly dependent on humans and out of direct control of the laboratory. Such errors in pre-analytical stage are only picked out later in the analytical or post-analytical phase [12].

Correct practices and strategies of error prevention can reduce pre-analytical errors, occur while collecting blood specimen, urine and cerebrospinal fluid. Most of these errors can be prevented easily if there is continuous education of the personnel involved and responsible for executing this phase [12]. These pre-analytical errors can lead to loss of patient trust in diagnostic services and also spoil the laboratory's reputation that can lead to an increase in the overall operating expenses, both for laboratories as well as the hospitals. Compliance with good laboratory practices can significantly reduce the frequency of pre analytical errors [9].

1. Incompetency and insufficient Knowledge:

Pre-analytical errors are mostly related to incompetency and insufficient knowledge of laboratory procedures; it is commonly seen that staff who attend to the patients tend to make these simple errors which delays the overall analytical process. In this phase one may observe the highest frequency of errors, the highest risk to professionals' health and the highest rates of human error. Studies indicate that approximately 40% to 70% of errors occur in the pre-analytical phase [13].

A study in Dallas stated that the top five pre-analytical errors are; specimen collection whereby the tube not filled properly, patient identification error, inappropriate specimen collection tube/container, test request error, empty collection tube [2]. Another study done in India highlighted similar pre-analytical errors but also mentioned some technique related errors such as; patient preparation, selecting and site preparation for blood collection, tourniquet application and time, proper venepuncture technique, order of draw, proper tube mixing, proper tube handling and specimen processing, centrifugation, special handling of blood specimens, stability for whole blood, serum and plasma, collection time and date, method of collection for other sample apart from blood [12].

The clinical laboratory also has its troubleshooting and error minimising steps to ensure that errors are not predominant in the later stages and those patients get the best quality results in a timely manner. This process

was highlighted in a study done in Pakistan, whereby once samples are received in the laboratory they are sorted out for any problem at the Central Reception Area (CRA) and registered before transporting to respective sections [9]. In case, any problem arises, it is manually registered in the logbook. Samples are rejected on the basis of pre-set rejection criteria, as follows: unlabelled specimen container, specimen without request form, incorrect tube (wrong choice of tube), wrong label/wrong medical record number, incorrect quantity or insufficient sample, hemolysed sample, anticoagulated sample Ethylenediaminetetraacetic Acid (EDTA and Citrate) with clots, improper sample transport, improper container closure, specimen delayed in transit making results invalid, diluted sample [9]. A study done by Wagar et al., [14] in California looked at samples that were collected by patient themselves, this area is important as it falls back onto the staff to be able to relay the correct information on sample collection and transportation of the specimens and if this step is not done well, the following errors would be seen; container leaking, contamination, improper collection and handling, collections container under filled or overfilled, specimen not received and using incorrect collection container [14]. A study done by Codagnone et al., [13] in Detroit showed how a total of 364 117 physicians' test orders, corresponding to 135 665 patients' visits, of which 7.4% (n = 10 094) were rejected because of errors in the pre-analytical phase of laboratory medicine. Stratification of data by the site of service revealed that the proportions of rejected specimens was the highest in the inpatient services (47.15%) followed by the emergency department and outpatient services with 27.40% and 25.39%, respectively. This simply shows how high the rates of these pre-analytical errors are and how they affect the overall service. The rejection criteria used in the study as part of a laboratory setting includes; clotted samples, hemolyzed and lipemic samples were visually applied. Only the clotted samples collected in tubes with EDTA and sodium citrate were counted [15]. The samples considered with insufficient volume were those presenting volume lower than the necessary for the conduction of a specific test, previously standardized and/or by consensus of the laboratory staff in this hospital [13].

2. Patient Interactions and Availability of Laboratory Handbook:

Staff interaction with the patients depicts the quality of service being provided. Quality of the medical service and professionalism of the staff is the main preference of patients, followed by good attitude and personal attention [16]. A study by Oja et al., [17] reported that patients needed additional instructions on the preparation of patients for laboratory tests (27.3%) and on the collection and handling of samples (27.8%) and about 21% were not

satisfied with the schedule of phlebotomy rounds [17].

Patient interaction and the way staff members approach the patients is one the most important aspects under patient interactions and service provided. A study done by Tadele et al., [18] in Ethiopia talked about the patience, communication, respect and language. In another study done in Ethiopia, about 67% of the respondents were satisfied with the courtesy of laboratory personnel, and 26% of them were unsatisfied with the orientation or advisory services provided to them before sample collection [19]. The same study also showed that 50% of respondents were satisfied with the clarity and adequacy of information they got, and 17.8% were dissatisfied [19]. An interesting aspect was discussed in a paper done in Fiji, on the importance of trust and communication for a better and effective treatment given to the patients [20]. The paper mentioned how trust and communication with a patient contributes to improved patient outcomes with patients being satisfied with the services [20].

Another important aspect which is related to the overall customer satisfaction is the availability of laboratory handbook. The laboratory handbook is a detailed booklet that contains all the information about the laboratory. The number of departments in the laboratory, the type of test available in the facility, number of staff members available, the location of laboratories, their contact details, the heads of the facility, the reference ranges for the tests, the conditions of sample transfer, other important laboratory related information patients may need to know in terms of sample collection and the processes involved in collection of sample [16]. A study done by Oja et al., [17] in Finland, mentioned how the laboratory user's handbook was updated paying special attention to the indices and the table of contents. Apart from these instructions for blood collection, including pictures of the tubes used for venepuncture for paediatric samples, were produced and delivered to the clinical units. The instructions for patient preparation for laboratory tests in clinical chemistry and nuclear medicine were rewritten and delivered to the clinics. The study showed that the Laboratory Users' Handbook, showed high (>20%) levels of dissatisfaction among patients [17].

3. Laboratory Infrastructure and Occupational Health and Safety (OHS):

Any health facility which provides service should always ensure that the area provided to the departments is safe and hygienic for patients. The OHS of the laboratory department is a crucial aspect when it comes to customer satisfaction as no patient would want to be seen or be treated in an environment which is not safe and hygienic for them. A study done by Mindaye et al., [21] in Ethiopia, highlighted some OHS issues which are important to consider while providing service. These include cleanliness of blood drawing area, comfort of chairs, Latrine accessibility and availability, Latrine cleanness

and comfort, cleanness and comfort of waiting area. In the study most (95.6%) of the respondents were satisfied with the service, where cleanliness of blood drawing area and comfort of chairs in blood drawing room (88.1%) were rated well. However, most of the clients showed low satisfaction level with latrine cleanness and comfort (63.5.0%), accessibility and availability of latrines (64.5%) [21]. Similar results were seen in a study done in Makkah, where cleanliness of blood drawing area and comfort of chairs had the higher satisfaction rate of 97.2% and 88.8% respectively [22].

A study done by Teresa et al., [23] in Ethiopia on patient's satisfaction indicated that more than half of the respondents were satisfied with the general medical laboratory services provided. However, there were some suggestions provided by respondents to improve overall satisfaction, which included adequacy of sitting arrangement and cleanness of waiting area [23]. Another study done in Ethiopia stressed on the lowest mean rating of satisfaction that was given for cleanness of latrine and location of the laboratory in the hospital with mean rating of 2.15% and 2.17% respectively [18]. The overall degree of Patients satisfaction with the laboratory services was high but patient satisfaction was lowest with the sanitation and location of latrines in the laboratory. Thus the hospital administration and the laboratory department were suggested to make every effort to enhance patients' satisfaction, particularly in sanitation and location of the latrine in the hospital [18].

In a study done by Hailu et al., [19] in Ethiopia showed how 25% - 50% respondents were dissatisfied with issues concerning the laboratory which also included the cleanness of the latrine. The result showed that 19%, 22% and 21% of the respondents respectively complained that they could not locate the laboratory, cashier office and latrine easily, thereby lessening their satisfaction rates with the laboratory. This finding was supported by various studies that showed laboratory patients had low satisfaction level with latrine cleanness and accessibility, waiting areas lack sitting facility and were not clean [19]. This was also depicted in another study which was done by Teklemariam et al., [24] in Ethiopia; there was dissatisfaction from the patients due to low attention given for the activities outside the laboratory room where tests are conducted, work overload or other reasons. The importance of all laboratory environments on client satisfaction such as cleanness of latrine and location of latrine, which include the difficulty in searching the location of the latrine to provide specimens like stool and urine, were also reported as the lowest rating of patients' satisfaction [24].

***Theme 2- Analytical related factors*:**

The Analytical phase is the most critical phase of the three phases involved in laboratory testing. Analytical phase looks at the processing

of all the clinical samples that are received into the laboratory. The samples are received, sorted and registered at the Central Reception Area (CRA) during the Pre-Analytical phase, before they are passed onto the various departments for processing in the Analytical phase. It is vital to ensure that if quality results are to be achieved then all the discrepancies are well dealt with in the Pre-analytical phase, as this will ensure that testing phase will be at its optimal levels and appropriate turnaround time of test will be achieved. To ensure that the analytical phase is prone to less errors, many steps are taken to ensure this as a study done by Agarwal et al., [25] in Delhi touches on an integral aspect which aids in reducing errors in the analytical phase. The number of laboratory errors in the analytical phase has decreased dramatically [25]. These drops are not only due to the increasing automation of laboratory processes but also as a result of the introduction of the External Quality Assurance Program (EQAP) & Internal Quality Assurance Programs (IQAP) to assess the quality of testing results. Improvements in the clinical laboratory have been made possible by the development of new procedures and techniques and the modification of existing techniques. Automated instruments are mostly used for testing in fields such as biochemistry, hematology, immunology, and genetic testing. The introduction of automation into testing processes has reduced the number of steps requiring human manipulation; also, the integration of computer hardware and software into analyzers has provided automatic process control and data processing capabilities [25].

Additionally, the laboratory must carry out validation of all analytical procedures to establish that the performance characteristics of the method(s) in question meet the requirements for the intended analytical application [25]. A study done by Alavi et al., [9] in Pakistan, where analytical errors that have been the focus of research in the past account for less than 10% of all the diagnostic mistakes. There are some issues which are evident today that needs to be addressed. Insufficiency of stocks, Availability of test and Turnaround of test results are very important aspects which need to be addressed to provide optimal service to customers [9].

1. Turn Around Time of Tests (TAT), Results Notification and Reporting:

Turnaround time of test includes all the steps from when the sample is received into the laboratory to when the results are sent out to physicians. A study done in Ethiopia shows that patients` satisfaction level towards TAT between 1-2 hours was about 5.3 times more likely than those patients awaiting their laboratory results for more than 2 hours [23]. Although timeliness of results reporting has not been a major focus in clinical laboratories, there is increasing pressure from clinicians to report results rapidly [23]. There are only sparse data, indicating that timeliness in reporting of laboratory results undoubtedly affects clinician and patient

satisfaction as well as length of hospital stay. Improving TAT is a complex task involving education, equipment acquisition, and planning. All the steps from test ordering to results reporting should be monitored and steps taken to improve the processes [26].

Apart from providing test results in a given time frame and meeting the turnaround time which are set, it is equally important to give accurate and quality results. The proper reporting process and the notification of results to the requesting physician is very important, as this diagnosis process of the patients are based on the results which are provided by the laboratory. There are at times when the paper based records are lost or do not reach the appropriate departments which causes delays in the treatment process of patients. In addition, there are delays associated with electronic based records in terms of internet connection and unavailability of reporting platforms at all health based facilities. A study done by Alelign et al., [5] in Northwest Ethiopia, mentioned the odds of patients who had never misplaced their laboratory results, were 2.1 times more likely to be satisfied with the service than those who had missing results. This is probably due to patients who were susceptible to unethical additional service fee and long waiting time to get results with associated delay in getting the clinical health provider service [5].

A study by Hailu et al., [19] in Ethiopia, showed how the pre-analytical phase affects the analytical phase. The result shows that (88.31%) of the respondents were not informed or aware of how long it takes to get the test result (turnaround time), while the remaining respondents were well informed about the laboratory turnaround time. Of these informed patients, 29.8% of them did not receive their result within the set turnaround time. Thus, it is very important to monitor TAT, as it is an ideal choice of activity to illustrate the laboratory's commitment in providing a high quality service. Improved TAT is key in providing client satisfaction in the laboratory [19]. A similar study also done in Ethiopia, showed that the highest rate of satisfaction was observed on timely test results for the human immunodeficiency viruses (HIV)/ Acquired Immunodeficiency Syndrome (AIDS) patients care [24]. However, the lowest rate of satisfaction was observed on critical value notification and on reporting of incomplete test results. Thus, it is very important that the laboratory heads and technicians have stringent process of reporting and realising of patient's records. They are to be treated with utter most confidentiality and must only be disclosed to the patient and the attending physicians [24].

2. Laboratory Standards and Protocols:

In a clinical laboratory setting operation there should be standards and protocols such as, seeing patients, process samples and provide results. This generally looks at the credibility of the laboratory, apart from this if the laboratory has set laboratory standards then the patients will have confidence in their results and treatment process. Currently in the developing

pacific islands clinical laboratories are using Laboratory Quality Management System (LQMS) [27]. This is a twelve element based guide which help shape up the laboratory and improve quality management of a public health or clinical laboratory. They are based on both the International Organisation for Standardization (ISO) 15189 and Clinical and Laboratory Standards Institute (CLSI) GP26-A3 documents [27]. A quality management system can be defined as "coordinated activities to direct and control an organization with regard to quality". This definition is used by the International Organization for Standardization (IOS) and by the Clinical and Laboratory Standards Institute (CLSI). When all of the laboratory procedures and processes are organized into an understandable and workable structure, the opportunity to ensure that all are appropriately managed is increased [5].

The quality model is organized into 12 (Organization, Personnel, Equipment, Purchasing and Inventory, Process Control, Information Management, Documents and Records, Occurrence Management, Assessment, Process Improvement, Customer Service and Facility and Safety) quality system essentials laboratory. These quality system essentials are a set of coordinated activities that serve as building blocks for quality management [5]. Under the twelve components of LQMS, assessment- external quality assessments, norms and accreditation are very important for a laboratory. These audit guidelines look at how the laboratory provides its service to its patients and customers and how they manage the complaints and issues which are raised [28].

In 2003, Pacific ministers of health created the Pacific Open Learning Health Net (POLHN). POLHN aims to ensure that health workers have access to the continuing professional development that they need. POLHN also builds capacity among local and regional academic institutions to develop and deliver online, continuing professional development programmes. This includes, since 2006 an online Diploma in Medical Laboratory Science for Pacific laboratory. Apart from this Pacific Paramedical Training centre (PPTC) also provides on-site support in (LQMSs training and auditing with WHO training tools and PPTC materials. Currently, Marshall Islands, Nauru, Solomon Islands, Vanuatu, Cook Islands, Fiji, Kiribati, Samoa, Tonga, American Samoa and the Federated States of Micronesia are part of the programmes being offered by PPTC and POLHN in collaboration with the WHO. PPTC continues to provide its External Quality Assurance Programme (EQAP) to 69 laboratories in 20 countries in the Asia Pacific region [29]. Adherence to such quality standards and participation in accreditation programs that certify this adherence can improve operational efficiency and customer service and reduce rates of laboratory errors. While there are limited published data that directly link accreditation to reduced laboratory errors and patient outcomes, studies have clearly shown that participation in

Proficiency testing (PT) programs, a key component of accreditation, leads to more accurate test results. For example, participation in just 3 rounds of an external Cluster of differentiation 4 (CD4) PT program resulted in 26% to 38% reduction in errors in the CD4 count among laboratories in resource-limited settings [40].

3. Sufficient Stocks and Availability of test:

In order for a clinical laboratory to function and provide service it is very important that the particular laboratory ensures that they have sufficient stock of all the reagents, kits and consumables which are used to perform the prescribed test. A study done in California identified about 15 to 45 % of the clinical laboratory operating budget is spent on supplies [32]. Given the size of expenditure, laboratory managers must pay close attention to the supply chain and develop effective strategies to manage their inventory. Areas that need analysis include the carrying cost of supplies, the cost to generate a purchase order, methods to efficiently count supplies on hand, processes to ensure that lot number items are used before their expiration, and detailed analysis of the inventory [32].

Purchasing and inventory management is a critical, or essential, component of the quality management system. Efficient and cost-effective laboratory operations need the uninterrupted availability of reagents, supplies, and services. Inability to test, even for a short time, is very disruptive to clinical care, prevention activities, and public health programs. Quantification is also a very important process that can help calculate how much is required of any particular item for a given period of time, and it is an essential part of a successful inventory management program [5]. At times due to insufficient stocks, test is unavailable to patients. This disrupts services and also delays the treatment process for patients. A study done by Kuupie et al, [33] in Ghana, Africa shows how poor supply chain management and stock-outs affects services. Adequate supply chain management prevents diagnostic test stock-outs and sustains Point of Care (POC) in diagnostic services in rural health facilities. Supply chain management has been defined by various studies to include all activities leading to the production, selection, quantification, negotiation, procurement, quality assurance, storage, inventory management, distribution and redistribution of a service or product [33]. There is poor supply chain management of POC diagnostics in the Upper East Region's rural Primary Health Care (PHC) clinics. The audit results in the study had shown higher deficiencies in inventory management and human resource capacity for POC diagnostic services in audited PHC clinics in rural Upper East Region's (UER) [34].

***Theme 3- Post-analytical related factors*:**

The Post-analytical phase is the most crucial phase of the total testing process and involves

evaluation of laboratory test results; release of test results in a timely manner to appropriate individuals, particularly critical results; and modification, annotation or revocation of results as necessary to support clinical decision-making. The frequency of laboratory errors during the post-analytical phase is lower than the frequency of errors during the pre-analytical phase, yet the post-analytical phase accounts for nearly one quarter of the entire laboratory process [32]. The post-analytical phase can be further divided into a phase inside the laboratory and a phase outside the laboratory (post-post-analytical phase). The post-post-analytical phase refers to procedures in which a physician makes medical decisions based on laboratory test reports in order to provide timely and effective patient care. In the post-analytical phase all test results that are not confirmed and released immediately upon analysis as part of the automated selection and reporting of test results must be evaluated through two mutually independent activities: review and confirmation of test results [32].

The review of test results begins by comparing the results with reference intervals and/or critical results, diagnoses and previous test results, if available. After this comparison, the results are confirmed as acceptable, or additional procedures are recommended, such as repeating the test with remark results from device, diluting the sample if the results fall outside the measuring range, or confirming unexpected results using the same or a new sample. If additional procedures give unacceptable results, the laboratory test report is released without the unacceptable (controversial) result, together with an explanation in the “Comments” area about why the test results are invalid and what further procedures are recommended. The review of results in the post-analytical phase may reveal mistakes or new problems in both the pre-analytical and analytical phases (such as sample misidentification, which is part of the pre-analytical phase but is very often recognised post-analytically). The test results must be reported accurately, clearly and unambiguously in a manner consistent with the specific instructions in the test operating procedures. The laboratory must define a format of laboratory results, whether electronic or paper based, and the manner in which they are released from the laboratory [32].

A study done by Sikaris et al., [35] at the University of Melbourne stated how ideally, the quality of laboratory report should be judged on its ability to answer the question(s) in the clinician’s mind when requesting the test on that patient. Both quality analytical data and the interpretation of that data against the clinical context of that patient are crucial to quality in post-analytical interpretation. The quality of the post-analytical phase also reminds us that clinical laboratories should primarily aim to be clinically effective, by supporting clinical decision-making and ensuring improved outcomes for patients [35].

1. Results Reporting & Notification (Format & Accessibility):

The most important part of the post-analytical phase is the results reporting and notification of results to the physicians. Results are important for the physicians to make a clinical diagnosis of patients and to administer the appropriate management. Thus it becomes crucial for the laboratory to ensure that the results released are of optimum quality and easy to interpret. There should be a proper format to which the results are laid out and the way it is set. Apart from this it is equally important that results are easily assessable to the physicians to fast track there treatment process. A study by Krleza et al., [32] in Croatia states that the most important attributes of the laboratory test report are the use of recommended, standardised language and syntax and the presence of all administrative and patient identification data, measurement results and confirmation data. Where appropriate, the report should also include comments necessary for interpretation of the test results and references and details for highly differentiated laboratory procedures. Comments are added only to improve the clinical value of the results and influence further diagnostic procedures or differential diagnosis. Comments that do not provide additional value to the results should be avoided, so it is easy for patients and physicians to understand and interpret results [32].

The authors also stated that the laboratory test report should use the terms “reference interval”, “therapeutic interval”, “recommended values” and “cut-off values” in accordance with the Croatian Chamber of Medical Biochemists (CCMB) guidelines [32]. The laboratory test report does not need to indicate the names of those who performed the sampling, received the sample in the laboratory or those who performed the analysis. However, this information should be recorded in the Laboratory Information System (LIS). An electronic overview of the laboratory test report should bear one of the following statements (or similar): (a) This laboratory test report has to been printed from the laboratory information system and is legally invalid without a stamp or signature.”; (b) “This is a printed copy of a laboratory report that is archived electronically and can be reproduced.”; (c) “This is a printed form of an electronically authorized laboratory report.”; or (d) “This is a laboratory test report printed from the laboratory information system.” It is necessary to indicate the place and time where a printed version of the laboratory report with authorised signature can be obtained. The laboratory test report can be released in electronic and/or printed form. LIS is usually connected to a hospital information system (HIS), laboratory test reports that have been confirmed can be printed out or sent electronically [32]. All this information ensures that patients will understand and also be able to interpret results better.

2. Availability of Staff to answer question and waiting time:

Patients' satisfaction with clinical laboratory services is essential as laboratory service plays a key role in patient management. Under-utilisation which could be due to dissatisfaction of clinical laboratory services can contribute to a worsened state of morbidity or mortality among patients. Information on satisfaction with clinical laboratory services is essential for policy and development of interventions to improve patient's satisfaction [36]. In the clinical laboratory setting is it important for staff to be well informed of the working procedures and be prepared for instances where results interpretation is needed. A study by Abera et al., [37] showed the ability of the laboratory personnel to answer questions on laboratory procedures and results, maintaining privacy and confidentiality of patient results which is about (83.2%) [37].

Another factor is that the technicians answering the phone only focus on client services duties, not specimen processing, or phlebotomy, or other questions or quires in regards to the laboratory. Being able to resolve issues efficiently and correctly requires that information be readily accessible and at the representatives' fingertips. This is probably the most difficult to attain because it requires the efforts of the Information Technology department and the testing sections, but once the information is in place it can be updated and it contributes tremendously to the overall efficiency of the services provided by the laboratory [38]. Waiting time is an important determinant of quality services as it is noted that in health care provision 'delays are expensive, not only in terms of direct costs incurred, but also in terms of the potential costs of decreased patient satisfaction and adverse outcomes' [39].

APPLICATION FOR PACIFIC NATIONS:

Based on these findings of this review, it can be said that patients' perception can greatly influence the utilization of laboratory services. Factors that have been found to facilitate the utilization of laboratory services include laboratory technician who display great professionalism, safe clinical settings, and good laboratory services in terms of short waiting time and accessibility of laboratory services. Overall, the importance of laboratory services in the developing pacific island countries cannot be ignored.

Moreover, currently not all pacific island countries are part of the external quality assessment programmes. Adopting the Laboratory Quality Management System (LQMS) and ensuring the laboratories are audited both by internal bodies and external bodies using the Stepwise Laboratory Improvement Process towards Accreditation (SLIPTA), is the way forward for all the laboratories in the pacific as these are World Health Organization (WHO) supported initiatives to raise standards and provide quality results to patients and customers.

In addition, the Pacific islanders' perception towards patients' perceptions on facilitators and barriers of utilization of clinical laboratory services must also be investigated. Such as study will provide the ideal foundation from which laboratory policies and strategies can be implemented and enforced. The ultimate goal of these surveys and analysing perception will be to bring in improvements in laboratory services in the Pacific and to improve the quality of life.

CONCLUSION:

In conclusion, the clinical laboratory is one of the important departments in the medical field which supports the diagnosis process of patients. The three phases are inter related to ensure that optimum quality of results is given out to the patients and customers of the laboratory. In order to have optimum quality level of results, the laboratory must ensure a few critical points. These points are competency and knowledge, patient interactions, service provided, availability of laboratory handbook, laboratory infrastructure and OHS, TOT, results notification and reporting, laboratory standards and protocols, sufficient stocks and availability of test, results reporting & notification (format & accessibility). These points form the core of the laboratory phases and if one these points are not looked into well it creates a delay in work and ultimately leads to dissatisfaction of the patients and customers as there will be delay in the overall service.

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