



Satisfaction of Doctors and Head Nurses about Clinical Chemistry Laboratory Services in King Abdulaziz University Hospital

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ABSTRACT

Customer satisfaction is an essential request of the quality management system requirements by the International Organisation for Standardization for the medical laboratories. The current study aimed to evaluate the users' (doctors and head nurses) satisfaction with chemical laboratory services at the King Abdulaziz University Hospital (KAUH). A cross-sectional study was carried out for six months among the medical staff team who use the clinical chemistry laboratory of KAUH. The current survey covered the tests in all four laboratory areas, including routine chemistry, hormones, special chemistry, and therapeutic drug monitoring. A well-designed and validated questionnaire was used and distributed through official emails. The collected data were statistically analyzed and represented in tables. The response rates among the consultants, residents and specialists were 53.3%, 85.7%, and 75%, respectively. The clinical chemistry laboratory provides all tests needed by most of the participants (66.7%). The areas of hormones and TDM had got fewer satisfaction rates compared with the other laboratory areas. All the participants agreed that turnaround time (TAT) was acceptable (> 60–80%). The laboratory technologist responses were highly satisfied for most of the participants (≥ 70%). The survey outcome concluded that most of the participants were satisfied with KAUH clinical chemistry laboratory. A better understanding of the satisfaction rates of the clinical chemistry laboratory customer at KAUH, as well as the areas of weakness in hormone and TDM areas, will be useful in constructing an action plan for further improvement.

Key Words: *Satisfaction, Clinical chemistry, Laboratory, Questionnaire.*

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INTRODUCTION

The Clinical Chemistry Laboratory at King Abdulaziz University Hospital (KAUH) is one of the most developed laboratories, being almost fully automated. Some of its instruments, such as Dimension Vista® 1500 System, which performs up to 2,000 tests per hour, are unique and not available in other laboratories in the Middle East. KAUH has been enrolled in Accreditation Canada Program. This development helps to improve quality, reliability, efficiency, and turnaround time [1].

Some authors, in their study of leveraging the full value and impact of accreditation, stated that the value and impact of accreditation are optimized when the tools of accreditation are utilized continuously in the organization's quality improvement program. The methodology and application of accreditation have the potential to be the force to improve care quality [2]. The most common samples received by a clinical chemistry

laboratory are body fluids such as blood, urine, and CSF, and less often pleural, ascitic, and drain fluids [3].

Meeting customers' needs is the main aim of all organizations. Customer satisfaction measurement is very valuable in the quality assurance programs of clinical laboratories. It is one of the accreditation requirements by big organizations and institutes, such as the College of American Pathologists (CAP) Laboratory Accreditation Program (LAP) and the Joint Commission on Accreditation for Healthcare Organizations (JCAHO) [4, 5]. Accuracy, precision, tests' speed, etc., are not the only applications needed by customers; their satisfaction is also an important approach to be applied [4].

A medical laboratory must implement strategies to fulfill the essential requirements. For instance, there are 1,515 conformance requirements that should be considered in all processes of the operations are covered by ISO 15189:2012. It is important to know that meeting all ISO 15189:2012 accreditation requirements is not easy [6].



Clause 4.14.3 focuses on the assessment of users' feedback through collecting information about their needs and requirements related to laboratory services. Their feedback is not the final step that should reach, but the solution of noted defects to improve the service is the main goal [7].

Physicians and nurses are considered the primary customers of laboratory services. The physicians order testing, whereas nurses are responsible for samples' collection and follow-up results [4]. They were developing methods to find out customers' feedback to help laboratories to identify and improve areas of defect. One of the useful ways to obtain customers feedback is to carry out satisfaction surveys [8]. This type of survey could provide the rate of satisfaction, but underlying defects behind dissatisfaction may remain unclear. Therefore, sometimes, direct contact with unsatisfied customers is required, along with surveys [9].

The aim of this study is to assess the satisfaction of physicians and nurses from different clinics and departments at King Abdulaziz University Hospital (KAUH), aiming to pick up the weak points that causing dissatisfaction in clinical chemistry at KAUH.

MATERIALS AND METHODS

The current study was a cross-sectional study using a designed survey in an educational hospital in Jeddah, Saudi Arabia [King Abdulaziz University Hospital (KAUH)] in the second half of 2016. This survey was carried out using a questionnaire planned using the collected data of the literature review materials and validated by an expert. The questionnaire was designed through a U.K. website, www.freeonlinesurveys.com. The statements were designed to cover all tests and the important aspects of clinical chemistry laboratory services at KAUH.

Four hundred forty-eight online questionnaires were sent to the doctors from different positions, including consultants, senior registrars, registrars, specialists, and house officers, as well as nurses from different departments in KAUH through their official emails. The ethical clearance was obtained from the hospital's ethical review committee to access the official emails of the staff. The questionnaire was preceded by a detailed explanation of the purpose of the study. Moreover, the respondents were asked to provide us with their contact information to allow us to contact them if needed.

The questionnaire had ten online pages and was divided into four main sections reflecting the various lab sections: routine chemistry, hormones, special chemistry, and therapeutic drug monitoring (TDM). Each section consisted of five questions: order frequency (OF), easy to order (E.O.), has a clear abbreviation, how much are the

results agreeable with their expectations regarding the patient condition, and how are they satisfied with turnaround time (TAT) for results. Other general questions were also provided: using services of other biochemistry labs in other hospitals, the name (s) of the lab (s)/ hospital (s) if applicable, whether they find a difference between the biochemistry lab in KAUH and others, a number of calls/number of orders, reasons for calling, lab staff response, and statements of improvement suggestions.

Scales of Respondents' Satisfaction

The respondents were instructed to rate their satisfaction using different scales. For OF "order frequency" (# of orders/week), five scales were used: 1–10 tests/week, 11–20, 21–30, 31–50, and > 50. For "has a clear abbreviation," "using services of other biochemistry labs in other hospitals," "if they find a difference between the biochemistry lab in KAUH and others," and "if the lab covers all their needs," only Yes and No statements were used. For E.O. "easy to order," "result and expectation compatibility," and "satisfaction with turnaround time" (in %), five scales were used: 1–20, 21–40, 41–60, 61–80, and 81–100%. For "# of calls/# of orders", "reasons for calling", "lab staff response", and "statements of improvement suggestions" (in %), 10 scales were used: 10, 20, 30 until 100%. In the question of "if they used the services of other biochemistry labs," if the participants answered with Yes, they were requested to indicate the type of that lab/hospital, governmental, private, or both. In the question of "if they find a difference between the biochemistry lab in KAUH and others," if the participants answered with Yes, they were requested to indicate which one is better and—optionally—to mention the name(s) of 1–4 lab (s)/hospital(s). The respondents were also informed to choose the "not applicable" option if appropriate. Additionally to these closed statements, the respondents were asked some open-ended questions such as How many inpatients do you see per day? How many outpatients do you see per week? And How many samples for chemistry lab do you order per day?

The collected responses were analyzed using the *Statistical Product and Service Solutions* (SPSS) program. The descriptive analysis of data was presented as tables for the frequencies and percentages. Also, the responses to the open-ended questions were analyzed using content analysis.

RESULTS AND DISCUSSION

The degrees of the shared staff and the departments in their frequencies were analyzed. The response rates from the Hematology, Obstetrics, and Gynecology, and

Surgical departments were the same (10.7%), whereas Orthopedic showed the lowest rate of response (7.1%). The satisfactory rates between using the KAUH chemistry laboratory and other services were recorded in **Table 1**.

The response rates among the consultants, residents, and specialists were 53.3%, 85.7%, and 75%, respectively, believed that the result of the KAUH laboratory is more reliable.

Table 1. The Satisfactory Rates Between Using KAUH Chemistry Laboratory and Other Services According to Participants' Positions and Departments

		Which is better laboratory							
		KAUH lab		N/A		Others		Same	
		Count	%	Count	%	Count	%	Count	%
Position	Consultant	7	53.8%	4	30.8%	1	7.7%	1	7.7%
	Nurse	0	0.0%	4	100.0%	0	0.0%	0	0.0%
	Resident	6	85.7%	0	0.0%	0	0.0%	1	14.3%
	Specialist	3	75.0%	1	25.0%	0	0.0%	0	0.0%
Dept	Hematology	2	66.7%	1	33.3%	0	0.0%	0	0.0%
	Medicine	6	75.0%	2	25.0%	0	0.0%	0	0.0%
	Obstetrics & Gy	1	33.3%	2	66.7%	0	0.0%	0	0.0%
	Orthopedic	2	100.0%	0	0.0%	0	0.0%	0	0.0%
	Pediatric	3	33.3%	3	33.3%	1	11.1%	2	22.2%
	surgical	2	66.7%	1	33.3%	0	0.0%	0	0.0%

The Orthopedic department satisfaction rate was 100% with the services provided by the chemistry laboratory at KAUH compared with other laboratories. This satisfaction reached 75% in the Medicine department, followed by 66.7% in the Hematology and Surgical departments. Moreover, it reduced as low as 33.3% in both the Obstetrics and Gynecology Department and the Pediatric department, as shown in **Table 1**.

Regarding the *routine chemistry area*, the order frequency (OF), easy to order (E.O.), the agreeable of results with participant expectation regarding the patient condition (Agree), and the satisfaction of participants about the result turnaround time (TAT) were presented as a mean,

percentage. The mean of the OF showed that all participants (except nurses) requested more than ten orders per day. Consultants believe that ordering tests were more difficult (> 40%) than residents and specialists (> 80% each). Moreover, the results of requested tests by consultants, residents, and specialists were not consistent with their expectations (> 60%), (> 80%), and (>80%). All the participants agreed that TAT was acceptable (> 60–80%). Twelve out of sixteen checked abbreviations (**Table 2**) were not clear, with different percentages. The most ambiguous test abbreviations with all positions were CTNI, HCY, and PROBPN, followed by C.E., PREALB, and BFT.

Table 2. List of Unclear Test's Abbreviations According to Different Positions in The Routine Chemistry Area

Routine Chemistry Unclear Abbreviations (%)	Position			
	Consultant	Nurse	Resident	Specialist
RFT	15.4%	0.0%	14.3%	25.0%
BFT	23.1%	100.0%	14.3%	50.0%
CE	30.8%	100.0%	42.9%	75.0%
LIPIDS	0.0%	0.0%	14.3%	0.0%
AMYLASE	0.0%	0.0%	0.0%	25.0%
FBS	0.0%	0.0%	14.3%	0.0%
MMB	38.5%	100.0%	28.6%	75.0%
CTNI	61.5%	100.0%	42.9%	75.0%
HCY	46.2%	100.0%	42.9%	75.0%
PROBPN	69.2%	100.0%	57.1%	50.0%
HCO3	15.4%	0.0%	0.0%	0.0%
PREALB	61.5%	0.0%	57.1%	50.0%

RFT: Renal Function Tests, **BFT:** Bone Function Tests, **C.E.:** Cardiac Enzymes, **LIPIDS:** Cholesterol & Triglycerides, **FBS:** Fasting Blood Sugar, **MMB:** Mass-CKMB, **CTNI:** Troponin I, **HCY:** Homocysteine, **PROBNP:** Prohormone- Brain natriuretic peptide, **HCO3:** Bicarbonate, **PREALB:** Pre-albumin.

The data collected from the *hormonal area* was represented as mean and frequency (percentage). The mean order of frequency (OF) by both the consultants and the resident's requests was less than ten orders per day. However, more than ten orders by specialists. The frequency of consultants who reported that ordering tests is more difficult was (> 40 %) than residents and specialists (> 80% each). Unfortunately, the consistency of hormone results from consultants' perspective was just >20%, but this measure was higher for residents (60%) and specialists (> 80%). The opinion of consultants

and residents about TAT was almost the same (> 20%), which increased in the case of specialists and nurses (60% and 80% respectively). The hormone area panel included 15 different tests. Twelve of them had a problem with their abbreviations with various percentages, according to the participants' responses. The highest unclear percentages (50%–100%) for most of the tests were recorded by specialists. GFT, DHT, and 17OHP were 100% unclear! While PTH, ACTH, renin, and insulin show 100% clear. Meanwhile, the unclear abbreviation percentage was low in consultants (**Table 3**).

Table 3. List of Unclear Test's Abbreviations According to Different Positions in The Hormonal Area

Hormone Unclear Abbreviations (%)	Position			
	Consultant	Nurse	Resident	Specialist
GFT	38.5%	25.0%	50.0%	100.0%
PTH	0.0%	75.0%	0.0%	0.0%
ACTH	7.7%	0.0%	0.0%	0.0%
Renin	7.7%	0.0%	0.0%	0.0%
INSULIN	0.0%	0.0%	16.7%	0.0%
VITD	7.7%	0.0%	16.7%	50.0%
IGF1IGF3	38.5%	0.0%	33.3%	50.0%
Insulin stress test	0.0%	0.0%	16.7%	50.0%
Anemia Panel	15.4%	0.0%	16.7%	50.0%
CORT	7.7%	0.0%	33.3%	50.0%
DHT	38.5%	25.0%	16.7%	100.0%
17OHP	15.4%	75.0%	33.3%	100.0%

GFT: Gonadal Function Tests, **PTH:** Parathyroid Hormone, **ACTH:** Adrenocorticotrophic, **VITD:** Vitamin D (total), **IGF1-IGF3:** Insulin Growth Factor1-Insulin Growth Factor3, **CORT:** Cortisol, **DHT:** Dihydroxytestosterone, **17-OHP:** 17-Hydroxyprogesterone.

Regarding the ease of test requesting, in the *special chemistry areas*, it had been found that the residents' group believed that tests of this area are easy to order (3.39), followed by consultants (1.69), then specialists (1.0). The high compatibility of results with a doctor's diagnosis was evident in the specialist's group (5.0) compared with residents (2.88) and consultants (1.55). Specialists are more satisfied with the turnaround time than nurses (3.33), residents (2.57), and consultants (1.59).

The abbreviations of 10 tests out of 12 in the special chemistry area were relatively unclear (**Table 4**). Five of those ten got unclear abbreviation ratings of more than 40%. CYSC was 100% unclear with specialists and nurses, 45.5% with consultants, and only 16.7% with residents. The same percentages recur in 5HIAA with specialists, residents, and nurses, but not with consultants (27.3%). Bence-Jones protein was 100% unclear with specialists and less than 40% with others.

Table 4. List of Unclear Test's Abbreviations According to Different Positions in The Special Chemistry Area

Special Chemistry Unclear Abbreviations (%)	Position			
	Consultant	Nurse	Resident	Specialist
Urinalysis	0.0%	25.0%	0.0%	0.0%
Osmolality	0.0%	0.0%	16.7%	0.0%
CYSC	45.5%	100.0%	16.7%	100.0%

24hr chemistry	9.1%	25.0%	16.7%	0.0%
VMA	0.0%	0.0%	16.7%	0.0%
5-HIAA	27.3%	100.0%	16.7%	100.0%
Bence Jonse protein	0.0%	25.0%	33.3%	100.0%
Stone Analysis	0.0%	25.0%	0.0%	0.0%
SPEPELE	54.5%	0.0%	50.0%	100.0%
PET Test	72.7%	0.0%	33.3%	100.0%

CYSC: Cystatin C, **VMA:** Vanillylmandelic Acid, **5-HIAA:** 5-Hydroxyindol acetic acid, **SPE (PELE)** Serum Protein Electrophoresis, **PET Test:** Peritoneal Fluid Test.

Regarding the data collected from *Therapeutic Drug Monitoring* (TDM) Area, the percentage of order frequency was higher among specialists by 1.0. This percentage was lower in residents and consultants by 0.84 and 0.40, respectively. Specialists' data was (5.0) easy to order compared with consultants (2.51) and residents (1.60). Furthermore, compatibility of results with physicians' perspectives and TAT of TDM results show 5.0 for specialists, 1.70 for consultants, and 1.30 for residents. As shown in **Table 5**, all TDM tests were unclear by various percentages with residents and consultants only. Residents show unclear abbreviations approximately for all tests.

Table 5. List of Unclear Test's Abbreviations According to Different Positions in The TDM Area

TDM Unclear Abbreviations (%)	Position			
	Consultant	Nurse	Resident	Specialist
VALP	18.2%	0.0%	40.0%	0.0%
CARB	9.1%	0.0%	40.0%	0.0%
PTN	18.2%	0.0%	40.0%	0.0%
PHENO	9.1%	0.0%	0.0%	0.0%
ACET	9.1%	0.0%	0.0%	0.0%
METHO	9.1%	0.0%	20.0%	0.0%
TACR	27.3%	0.0%	40.0%	0.0%
CSA	27.3%	0.0%	20.0%	0.0%
CSAE	36.4%	0.0%	20.0%	0.0%
AMA	27.3%	0.0%	0.0%	0.0%

VALP: Valproic Acid, **CARB:** Carbamazepine, **PTN:** Phenytoin, **PHENO:** Phenobarbital, **ACET:** Acetaminophen, **METHO:** Methotrexate, **TACR:** Tacrolimus, **CSA:** Cyclosporine, **CSAE:** Cyclosporine-Extended, **AMA:** Amino acids.

The participants' responses towards the laboratory communication were assessed in this survey. We found that 60% of participants need to call the laboratory ten times every 100 orders. Of the total participant calls, 10% were to correct or delete an order, followed by inquiries about sample receiving time and container/tube used.

Under some conditions, health team providers needed to contact the clinical chemistry laboratory to clarify different issues regarding patients. The most common reasons for calling were studied. Fortunately, the laboratory technologist responses were highly satisfied for most of the participants ($\geq 70\%$). However, 20% of the participants assessed the effectiveness of laboratory staff response in general as well as the positivity of first call response at only 10%.

Regarding the patient report formatting, the participants were asked about their opinions about the patient report format, including the following criteria: general design, patient information, clarity of results, presence of normal ranges, font size and type, and arrangement of tests. Most of the participants ($\geq 80\%$) did not suggest any format changes on the patient report. 13%–20% of participants were satisfied by just 10%, suggesting a need to make proper improvements in report formatting. Overall, the clinical chemistry laboratory services provided all the needed tests by most of the participants in a frequency of (66.7%) satisfaction in this survey (**Table 6**).

Table 6. Clinical chemistry laboratory tests cover all participants' needs

Do the tests cover all your needs?	Yes	No
	Count	12
%	66.7	33.3

The current cross-sectional descriptive study tried to assess the users' satisfaction related to the laboratory services of the clinical chemistry laboratory of one of the highly qualified labs in Saudi Arabia in an accredited hospital, which is the KAUH. This survey covers all clinical chemistry laboratory areas, investigations, test requesting, report formatting, and staff responses.

The satisfactory rates between using KAUH chemistry laboratory and other services among the participants, 57.1% believed that there is a difference between the chemistry laboratory at KAUH and the same services provided by other laboratories. The response rates among the consultants, residents, and specialists are 53.3%, 85.7%, and 75%, respectively. Just one consultant assumes that other laboratory services are better. A

previous study reported that teaching institutions tended to have higher percentages of poor ratings for communication of relevant information and timeliness of reporting [10].

The current laboratory technologist responses were highly satisfied for most of the participants ($\geq 70\%$). However, 20% of the participants assessed the effectiveness of laboratory staff response in general as well as the positivity of first call response at only 10%. Also, there are high compatible expectations with the doctor's diagnosis, especially in the specialist's group (5.0) compared with residents (2.88) and consultants (1.55). The specialists are more satisfied with the turnaround time of results of this area than nurses (3.33), residents (2.57), and consultants (1.59). These findings agree with that of another study, which reported that the overall satisfaction for surgical pathology reports as well as satisfaction with report test turnaround time, completeness, and style was high. Report turnaround time received the lowest scores of all parameters [11].

The main problem in any institution that may affect its provided services is poor communication or miscommunication among personnel. Poor or miscommunication from any side will affect the required process needed from that side. This highlights the need for improving the communication skills among laboratory staff and users (doctors and nurses) to improve quality in laboratory services aiming at patient satisfaction. As mentioned in a previous study, Patient satisfaction is the degree to which the patient's desired expectations, goals, and or preferences are met by the health care provider and or services [12, 13].

Through this survey, we found that specialists are the most satisfied group over other groups. Their satisfaction ratings showed high percentages (60%–100%) over most of the services. Moreover, we found that number of orders is somehow affected by the doctor's position. The analyzed data reveals that consultants request fewer orders compared with others. This is maybe due to two reasons: because of their experience, they do not need a lot of investigations besides their diagnosis to make decisions, and/or they delegate other doctors of other positions to order the tests.

Carrying out such an action will provide the laboratories and the hospital with profoundly accurate and precise information about the impact of the quality of their services. It will put the basis for the improvement and development of the services. In addition, the whole practice of the lab and the hospital will fulfill the requirements of clause 4.14.3 in ISO 15189:2012. Although most of the participants in this survey had dealt with other chemistry laboratories, a considerable percentage of those participants agreed that the chemistry laboratory at KAUH is the best. However, correcting

specific defects identified by one or even a few customers, as mentioned in the current study, maybe of insignificant value to be detected on the radar of subsequent surveys. Previous studies stated that the service providers implement improvements to address defects. They must build an opinion to determine whether or not satisfaction has improved [9, 14].

Briefly, the current descriptive study revealed that the clinical chemistry laboratory at King Abdulaziz University Hospital (KAUH) generally provides good services that cover the needs of 66.7% of its users. However, whatever the quality of services provided, there must be points of the defect and/or weakness. This study attempted to discover some of these weaknesses in the clinical chemistry laboratory, hoping to create a manual guide including the points of weakness that can help to improve the services in the future.

Limitations

The most obvious limitation in this study was the small number of participants compared with the total number of doctors and nurses who received the survey, although the survey had been sending several times to all hospital staff of doctors and nurses through their emails. In addition, we contacted some of them and their heads of departments personally.

Some abbreviations were unclear for some participants, maybe because they do not use these tests in their specialty. If this is not the case, we have to find a way to clarify those abbreviations and frequently update doctors with any changes or updates.

CONCLUSION

In general, the current survey shows that there was a high level of satisfaction about the services provided by the hormones and TDM areas of the clinical chemistry laboratory at KAUH. Most of the participants depended on this laboratory and thought it was better than other laboratories that they used.

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