



Research Article

Appropriateness of the Lab Utilization in PHCs, Riyadh, Saudi Arabia

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Citation: Alkhalifah AM, Yahya A, Alshahrani A, Albattal S, Kofi M (2022) Appropriateness of the Lab Utilization in PHCs, Riyadh, Saudi Arabia. J Family Med Prim Care Open Acc 6: 172. DOI: 10.29011/2688-7460.100072

Received Date: 02 March, 2022; **Accepted Date:** 08 March, 2022; **Published Date:** 14 March, 2022

Abstract

Background: After years of steady growth, laboratory test demands have surpassed those of any other medical act; therefore, it is critical to ensure that the requested testing is appropriate. This study aimed to assess the rate of overutilization of HbA1c, TSH, and Vitamin D tests among family physicians in a tertiary care hospital and primary care centers in Saudi Arabia. **Methods:** This was a cross-sectional chart review study conducted at Prince Sultan Military Medical City (PSMMC), Riyadh, Saudi Arabia. A structured data collection form was designed to collect data that fulfill the study objectives. Data were collected by the study authors through reviewing their files and lab investigations. To determine whether tests are over utilized or not, we followed certain criteria's for each test. Latest American Diabetes Association (ADA) was followed for HbA1c. For TSH test, we followed latest guidelines of American Thyroid Association (ATA). American Society for Clinical Pathology guidelines was followed for Vitamin D. **Results:** Data of a total of 380 patients was analyzed. The rate of overutilization was the highest for vitamin D at 57.14% followed by TSH at 40.47%, and HbA1c at 25.98%. When the rate of overutilization was calculated by the physician degree it differed significantly only with HbA1c, being the highest among SHO at 50%, with a P-value of <0.001. There were no significant differences in the overutilization rates of the studied lab tests by physicians' nationality or gender. **Conclusion:** The rates of the overutilization of the studied lab tests (HbA1c, TSH, and vitamin D) are considered high, particularly Vitamin D.

Keywords: Laboratory utilization; Inappropriate; Overutilization; PHCs

Introduction

After years of steady growth, laboratory test demands have surpassed those of any other medical act [1]. In the last decade, the annual increase in the use of laboratory tests in the United States and Europe has been around 5%. Medicare spending on clinical laboratory tests accounted for 1.7% of total healthcare spending [2]. Therefore, it is critical to ensure that the requested testing is appropriate. Appropriate laboratory testing refers to the process of requesting tests at the right time for the right reason and using the correct procedures [3,4]. Overutilization and underutilization are two types of inappropriate testing, with overutilization being the ordering of tests that are not suggested and underutilization

being the failure to order indicated tests [5]. Overuse and underuse can both be physically and financially harmful, as well as life threatening to patients. Overutilization, for example, could result in unnecessary blood sample collection, increased costs, and inaccurate test results, whereas underutilization could result in serious consequences such as morbidity due to insufficient or late laboratory testing requests [5].

Laboratory testing accounts for up to 70% of therapy decisions. As a result, clinical laboratories are valued for their role in guaranteeing the accuracy of disease diagnosis, management, and counseling [6,7]. There are widely variable test ordering patterns at different healthcare settings even for similar patient populations. In addition, there are variations in individual healthcare professional test ordering patterns especially when it comes to deciding on the number of tests necessary for diagnosis or

treatment [8]. In addition to that, it is difficult to reach a consensus about what describes appropriate lab testing [9].

Unnecessary laboratory testing account for between 10% to 70% of all tests, as a result, they contribute to incorrect diagnosis and therapy [10]. The overuse of laboratory testing is influenced by a variety of factors, including the practitioners' experience and specialty [11]. Experienced physicians are assumed to be aware of and familiar with the best and most readily available laboratory tests for patients. In contrast, less experienced physicians or residents may waste laboratory resources by over-requesting unnecessary laboratory testing [12]. More broadly, it has been demonstrated that increasing doctors' awareness or alertness to factors that contribute to overutilization leads to a reduction in inappropriate testing requests [13]. Previous local studies showed dissatisfaction among clinical laboratory professionals [14] and reported an increase in the demand for clinical laboratory services despite the fixed budget for such services [15].

We conducted this study aiming to assess the rate of overutilization of HbA1C, TSH, and Vitamin D tests among family physicians in a tertiary care hospital and primary care centers in Saudi Arabia.

Methods

This was a cross-sectional chart review study that was conducted among family physicians working at Prince Sultan Military Medical City (PSMMC), a family medicine and community center in Riyadh, KSA, who ordered the following laboratory tests: Vitamin D test, HbA1c test, and TSH test. The study included data during the period from January 2021 to December 2021. A structured data collection form was designed to collect data from the previously mentioned institution labs. The collected data included Vitamin D order, TSH order, HbA1C order, patient chief complaint, history of thyroid disease, type of DM. this is in addition to the physicians' socio-demographic characteristics

including age and position. Data were collected by the study authors through reviewing their files and lab investigations. To determine whether tests are over utilized or not, we followed certain criteria's for each test. Latest American Diabetes Association (ADA) was followed for HbA1C. For TSH test, we followed latest guidelines of American Thyroid Association (ATA). American Society for Clinical Pathology guidelines was followed for Vitamin D.

Ethical Consideration

The study has been conducted after taking ethical approval from the ethics review committee in the research center, PSMMC, Riyadh, Saudi Arabia. A second approval was taken from the head of the family and community department to fill the respective form from the lab.

Statistical analysis

Data were analyzed by using Statistical Package for Social Studies (SPSS 22; IBM Corp., New York, NY, USA). Continuous variables were expressed as mean \pm standard deviation. Categorical variables were expressed as percentages. The Chi-square test was used for categorical variables. A p-value <0.05 was considered statistically significant.

Results:

A total of 380 patients were recruited in the current study, with a mean (\pm SD) age of 43.15(\pm 18.20) years, and a mean (\pm SD) BMI of 29.71(\pm 6.00). For the characteristics of the physicians, they were mostly Saudi (70.9%), more than half (53.2%) of them were females, and the highest percentage were consultants at 34.4%. HbA1c was ordered for 73.9% of the patients, and it was justified for 54.7%. TSH was ordered for 56.6% and it was justified for 33.7%, while vitamin D was ordered for 51.6% and justified for 22.1%. Data is shown in Table 1.

		Number	%
Gender of patient	Male	162	42.6
	Female	218	57.4
Age of patient(Mean, SD)		43.15	18.20
BMI of patient(Mean, SD)		29.71	6.00
HbA1C ordered	Yes	281	73.9
	No	99	26.1
HbA1C justified?	Yes	208	54.7
	No	73	19.2
	NA	99	26.1

TSH ordered	Yes	215	56.6
	No	165	43.4
TSH justified?	Yes	128	33.7
	No	87	22.9
	NA	165	43.4
Vitamin D ordered	Yes	196	51.6
	No	184	48.4
Vitamin D justified?	Yes	84	22.1
	No	112	29.5
	NA	184	48.4
Dr. Degree	Resident	69	20.1
	Registrar	78	22.7
	Senior Registrar	73	21.3
	SHO	5	1.5
	Consultant	118	34.4
nationality of doctor	Saudi	244	70.9
	Non Saudi	100	29.1
gender of doctor	Male	161	46.8
	Female	183	53.2
Center	WHC	374	98.4
	NADEEM	2	.5
	OREJA	2	.5
	SOUTHERN	1	.3
	YASMINE	1	.3

Table 1: Characteristics of the patients and family physicians.

The rate of overutilization of HbA1c, TSH, and Vitamin D tests among family physicians is shown in Table 2. The rate of overutilization was the highest for vitamin D at 57.14% followed by TSH at 40.47%, and HbA1c at 25.98%.

	Number of test	Number of overutilization	Rate of overutilization (%)
HbA1c	281	73	25.98
TSH	215	87	40.47
Vitamin D	196	112	57.14

Table 2: Rate of overutilization of HbA1c, TSH, and Vitamin D tests among family physicians.

When the rate of overutilization was calculated by the physician degree it was found that the rate of overutilization differed significantly only with HbA1c, being the highest among Senior House Officers (SHO) at 50%, with a P-value of <0.001. On the other hand, the difference was statistically nonsignificant (P>0.05) in cases of TSH and vitamin D, where the highest utilization rate was from residents and registrars at 46.51%, and 56.86%, respectively, as shown in Table 3.

Dr. Degree	HbA1C			TSH			Vitamin D		
	Number of test	Number of overutilization	Rate of overutilization (%)	Number of test	Number of overutilization	Rate of overutilization (%)	Number of test	Number of overutilization	Rate of overutilization (%)
Resident	45	20	44.44	43	20	46.51	51	28	54.90
Registrar	52	15	28.85	54	21	38.89	51	29	56.86
Senior Registrar	60	8	13.33	31	11	35.48	18	7	38.89
SHO	4	2	50.00	3	0	0.00	2	1	50.00
Consultant	95	14	14.74	57	17	29.82	46	26	56.52
P value	<0.001*			0.307			0.471		

*Significant p value

Table 3: Rate of overutilization of HbA1C, TSH, and Vitamin D tests among family physicians by Dr. Degree.

There were no significant differences in the overutilization rates of the studied lab tests by physicians' nationality as shown in table 4, as all p values were >0.05. However, it was noticed that the overutilization rate was the highest among the Saudi physicians at 25.28%, 38.36%, and 56.69% vs. 17.72%, 30.95%, and 46.34% for non-Saudi, for HbA1c, TSH, and vitamin D, respectively.

Nationality of the doctor	HbA1C			TSH			Vitamin D		
	Number of test	Number of overutilization	Rate of overutilization (%)	Number of test	Number of overutilization	Rate of overutilization (%)	Number of test	Number of overutilization	Rate of overutilization (%)
Saudi	178	45	25.28	146	56	38.36	127	72	56.69
Non Saudi	79	14	17.72	42	13	30.95	41	19	46.34
P value	0.184			0.380			0.247		

Table 4: Rate of overutilization of HbA1C, TSH, and Vitamin D tests among family physicians by nationality of the doctor.

When looking at the overutilization rate by physician gender as shown in Table 5, male gender showed higher overutilization of HbA1c compared to females at 23.81% vs 22.14%, respectively, while in contrast, the overutilization rate of TSH and vitamin D were higher by females compared to males, though all these differences were statistically non-significant (P>0.05).

Gender of the doctor	HbA1C			TSH			Vitamin D		
	Number of test	Number of overutilization	Rate of overutilization (%)	Number of test	Number of overutilization	Rate of overutilization (%)	Number of test	Number of overutilization	Rate of overutilization (%)
Male	126	30	23.81	78	27	34.62	76	41	53.95
Female	131	29	22.14	110	42	38.18	92	50	54.35
P value	0.750			0.617			0.959		

Table 5: Rate of overutilization of HbA1C, TSH, and Vitamin D tests among family physicians by gender of the doctor.

Discussion

Diagnostic laboratories are recognized as a critical department in the health sector, and hence preserving lab resources is important [16]. Management of laboratory resources, in particular, in institutions that give free laboratory testing to patients and are subsidized by governments, is crucial for optimizing laboratory use. The current study evaluated the overuse of three laboratory tests, and unfortunately, the rates of overutilization were high, particularly for Vitamin D. The current study findings are consistent with several prior studies that have similarly found the overuse of laboratory testing in ordinary hospital practice, with percentages of unnecessary tests ordered ranging from 40% to 65% in university hospital medical wards [5,13].

According to the New England Health Institute, 30% of overall healthcare spending is wasted on unneeded, unproductive, expensive, and wasteful treatments, totaling \$700 billion in wasteful spending [17]. Physicians are accountable for the majority of such wasteful expenditures, as imaging and laboratory testing are the two largest sources of expense [17].

Overuse of Vitamin D and HbA1c testing has also been observed in other healthcare settings [18]. The growth in HbA1c testing might be attributed to its replacement of blood glucose testing in the diagnosis of type 2 diabetes [19]. While there are no other plausible explanations for the increase in vitamin D testing, it has been argued that high media and individual attention may play a significant influence [20].

Several hypotheses have been proposed as to why physicians order daily laboratory tests indiscriminately, including the ability to gather an abundance of information and trends that would eventually help make a diagnosis, a lack of specific guidelines or consensus regarding testing indications, concern about potentially avoidable malpractice, and the ease of ordering through electronic medical record systems [21-23]. Physicians-in-training, especially those in their early stages of training are particularly prone to the habit of over-ordering exams. Duplicating role-modeled behavior, the desire to be complete, pre-emptive ordering or rushing an evaluation, discomfort with diagnostic uncertainty, curiosity, unfamiliarity with associated costs and harms, defensive medicine, patient's request, faculty demand and training institution culture, lack of training to weigh benefit relative to cost and harm, and the ease of access to services in hospitalized patients are some of the reasons [21-23].

Beyond the direct cost of the test itself, overuse can potentially have unintended consequences that raise expenses. Excessive diagnostic testing puts patients at risk of harm and does not enhance diagnostic accuracy [24]. Iatrogenic anemia [25-28], increased length of stay and unexpected readmission [29], patient discomfort [30-32], and patient discontent are all negative clinical

outcomes that can emerge from needless testing [33]. These negative consequences run counter to the goals of any healthcare system, and reducing them has a higher value than simply saving money.

The current study has some limitations including the small sample size, the sample was taken from one healthcare institution in the kingdom, and therefore the results cannot be generalized. Our findings add to the growing body of evidence that overutilization of laboratory testing requests is widespread, especially among SHO. Most research that has focused on inappropriate laboratory test requests has aimed to minimize the occurrence of and manage such requests, as well as conserve resources so that they may be provided to the correct patient at the right time. Inappropriate laboratory testing may be managed with the use of educational activities, understanding the cost-effectiveness of tests, and other techniques.

Conclusion

The rates of the overutilization of the studied lab tests (HbA1c, TSH, and vitamin D) are considered high, particularly the Vitamin D one. Education activities are needed to minimize the occurrence of and manage such requests.

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