AMERICAN UNIVERSITY OF BEIRUT

UTILIZATION PATTERNS OF UNIVERSITY HEALTH SERVICES AMONG THE AMERICAN UNIVERSITY OF BEIRUT STUDENTS

by
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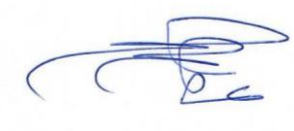
Signature:  Date: February 14, 2021

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ABSTRACT
OF THE THESIS OF

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Title: Utilization Patterns of University Health Services among the American University of Beirut Students

Background: Worldwide, a large majority of universities provide primary health care services and eventual referral to more specialized care to their students. The presence of health services on campus can create an environment of safety and support for the students who, particularly at this age, need physical and mental stability to appropriately reach their academic and personal goals. Adequate University Health Services (UHS) can also reduce students' dropout rates. Published data on utilization of UHS by students is limited. Some studies report under-utilization, and others describe a specific seasonal pattern for health seeking.

Objectives: This study aims to calculate the utilization ratios of UHS by university students over a period of three academic years, to identify prevalent conditions for which American University of Beirut (AUB) students consult, to assess monthly and daily trends in health services utilization, and to explore associations between student characteristics and utilization patterns.

Methods: This is a descriptive case-series that involved a cohort of AUB students who were beneficiaries of UHS over three academic years between 2015 and 2018. Anonymous data were obtained from the medical records of students on Filemaker.

Results: This study of UHS clinics found that the utilization ratio of students at AUB increases with students' age over time. Each student visited UHS 1.3 times yearly on average. In general, most diagnoses were related to health maintenance, followed by dermatological complaints. Most of the referrals were made to psychiatry, followed by ophthalmology and orthopedics. A seasonal distribution was detected, marked by a higher peak in winter and a lower dip in summer. Medical students, and students of other health-related faculties, had significantly more visits to UHS than students from other faculties. Expenditures on laboratory tests increased over the three academic years. Older age, female gender, and actual number of completed visits were found to be predictors of higher expenditures.

Conclusion: A UHS center serves a basic and essential purpose for the health and well-being of students. Beyond its basic curative role, it can provide those students with knowledge and skill necessary to stay healthy in future life. The UHS is also a very important center for training of Primary Health Care (PHC) practitioners, especially Family Medicine (FM) residents. The rotation should be enhanced so that no opportunity for learning is wasted through easy referral or loss of information from data loops that are not well closed. Finally, data accumulated at Faculty of Health Sciences (FHS) are important sources to be minded to address several research issues of importance regarding the health of adolescents and young adults.

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ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
ACHA	American College Health Association
AUB	American University of Beirut
AUBMC	American University of Beirut Medical Center
BAU	Beirut Arab University
BAUHC	Beirut Arab University Healthcare Center
BMI	Body Mass Index
FM	Family Medicine
HIP	Health Insurance Plan
HIV	Human Immunodeficiency Virus
IOM	Institute of Medicine
NCDs	Non-communicable Diseases
PHC	Primary Healthcare
SDG	Sustainable Development Goals
UHS	University Health Services
UN	United Nations
US	United States
WHO	World Health Organization

CHAPTER I

INTRODUCTION

A. General Background

The third goal of the United Nations (UN) Sustainable Development Goals (SDG) targeted health promotion and well-being for all at all ages (1) . Adequate access to healthcare services is a main predictor of better health outcomes (2). Optimal health services should be able to manage a wide array of health issues in addition to treatment of acute and chronic illnesses, such as health promotion, early detection and prevention of diseases (3). In many health care systems, access starts with the primary care level. Providing access to high quality primary healthcare services has been shown to shift the care from emergency and critical care to ambulatory and preventive care, which significantly decreases health expenditure (4). Hence, various countries are putting efforts on establishing a good primary healthcare (PHC) system that would be the cornerstone of achieving better health.

Among various age groups with special health needs, young adults who are university students often end up receiving PHC through University Health Services (UHS) (3). Most university students are below twenty-four years of age and expected to be relatively healthy. However, this age group may be affected by psychiatric, behavioral, and chronic disorders (5). The availability of tailored UHS can yield improvements in clinical presentation, adherence to medications, and healthcare utilization (6). Despite the relatively widespread use of UHS, the utilization patterns of those services are rarely published outside regular institutional reports (7). Such

publications would provide benchmarks for any educational institution planning to establish or desiring to evaluate a UHS system.

In Lebanon, several private universities have established or are considering establishing UHS to attend to the needs of their students. The American University of Beirut (AUB) has been offering a health insurance plan to its community, including faculty, staff, and students through a comprehensive UHS which can be retraced to 1945. All enrolled students are offered access to PHC through the UHS clinic and can be referred to secondary and tertiary medical care at the AUB medical center (AUBMC) if need be. The UHS prepares annual reports focusing on volume of services provided, from an accounting point of view. The components of utilization are rarely analyzed from the user's point of view, even though this analysis could lead to a better understanding of the efficiency and quality of care provided.

B. Study Aim and Rationale

In this study, we aim to explore the patterns of PHC utilization by a cohort of AUB students in three consecutive academic years, in an attempt to define the ideal structure of a UHS program. Information on utilization from what is arguably the largest and oldest established UHS in Lebanon will be exploited to generalize knowledge which will help stakeholders and decision-makers to optimize the UHS service provision in the future, and to propose additional performance indicators to assess these services.

C. Study Objectives

The objectives of this analysis of utilization patterns at AUB-UHS are:

a. To calculate the utilization ratios of UHS by university students over a period of three academic years.
b. To identify prevalent conditions for which AUB students consult.
c. To assess monthly and daily trends in health services utilization.
d. To explore associations between student characteristics and utilization patterns.

D. Research Questions

a. What are the characteristics of utilization of UHS by AUB students?
b. Is there an association between student characteristics and utilization patterns?
c. Do utilization patterns vary daily or monthly?

CHAPTER II

LITERATURE REVIEW

A. Introduction on the content of the section

This section will review the key concepts related to the study, particularly primary health care and university health services. It will also discuss the studies on the evolution of these services with a historical overview in the United States (US) and Lebanon. Additionally, it will highlight the studies tackling the provision of UHS by universities.

B. Overview of key concepts

1. Primary health care

The term "primary care" was first introduced in 1961, and it has been defined in different ways. Some definitions were based on specifying the care providers such as family physicians, general internists, pediatricians, and obstetricians and gynecologists. Others identified it according to the group of activities included such as treating or alleviating common medical conditions. Another way of defining "primary care" was emphasizing its characteristics including comprehensiveness, continuity, and accessibility, among others. Other "primary care" definitions highlighted its role as an entry point to more advanced levels of care, in addition to its role in organizing the healthcare system. (8, 9)

The Institute of Medicine (IOM) encouraged not to base the concept of "primary care" on a single definition (8). Hence the IOM issued a newer definition of primary care to incorporate its multidimensional aspect: *"Primary care is the provision*

of integrated, accessible health care services by clinicians who are accountable for addressing a large majority of personal health care needs, developing a sustained partnership with patients, and practicing in the context of family and community." (8).

The concept of primary healthcare was widely announced in the declaration of Alma-Ata in September 1978 that urged governments and communities in general to promote health for the world population as a fundamental human right. It also confirmed the concept of health as a state of complete wellbeing physically, mentally, and socially, and not just the absence of disease (10). The aim of PHC, as reported by the World Health Organization (WHO) in 2008 in the report "*Closing the gap in a generation: health equity through action on the social determinants of Health*" is to improve health outcomes through formally reorienting care towards health promotion and disease prevention, along with quality curative care (11).

2. University health services

Worldwide, a large majority of universities provide primary health care services and eventual referral to more specialized care to their students. Such services are important for the students transitioning from childhood to adulthood (5). Students at this phase of their life experience new challenges being alone away from their parents. In addition to the shift from school to university as a whole new environment, they endure the stress of studying and exams, and financial difficulties, among others. Thus, UHS should be designed to cover student health education and surveillance, in addition to paying particular attention to physical and mental health problems (12), to help them reach their academic and personal potentials.

The past century has witnessed a considerable evolution in the planning and implementation of UHS, with some countries achieving the development of centers that are well designed to aim at ensuring adequate students' health and wellbeing. The presence of health services on campus can create an environment of safety and support for the students who, particularly at this age, need physical and mental stability to appropriately attend their courses and assignments (13). Additionally, providing treatment for physical problems along with creating a support system for students can fasten their recovery and help their return to their classes sooner. Hence, adequate UHS can significantly decrease the lost study time and enhance the academic abilities of students. This can also reduce students' dropout rates, a main problem in the universities in the US between 1920 and late 1970s (14).

In 2009, President Obama officially announced the reform of the US education system and dedicated a big fund for this issue. Administrators also emphasized the importance of retaining enrolled university students until attaining their academic goals (15). The identification of the reasons behind students' dropout was a concern for university leaders, but there was an agreement on the important role of student support programs, particularly student health services as a substantial factor for retaining students (16).

C. Providing health care services by universities

1. Historical overview

The literature describing the historical background and evolution of UHS is scarce. William Christmas, the director of the student health service at Duke University in North Carolina, and the former president of the American College Health Association

(ACHA) reviewed the factors that led to establishing the first UHS in the US and their evolution.

In the early 1800s, colleges in the US began to introduce physical education and hygiene courses inspired by the European philosophy "A healthy mind in a healthy body". Concern for students' health increased with advances in medicine, and the university leaders recognized the necessity of taking care of the students' health appropriately.

In 1860, Edward Hitchcock who was the first college health physician, added the concept of hygiene in his book of anatomy and physiology at Amherst College. A year later, Mount Holyoke College started providing medical care and teaching physical fitness. Later on, American colleges started to hire medical doctors to their faculties, and multiple health centers were developed at the end of the 19th century (17). In 1901, the University of California was one of the first schools to establish a modern health program, to reduce the students' absenteeism that was found to be mainly due to sickness rather than lack of interest to attend. Epidemics and infectious diseases such as typhoid and tuberculosis were also among the major reasons behind establishing students' health programs (18).

In the early part of the 20th century, and after the World War I, the US Congress highly recommended the incorporation of the students' health services in universities and described its activities including health exams, consultations, urgent care, among others. Hence, well established university health centers were born. To enhance the role of UHS, the American College Health Association (ACHA) was formed.

Meanwhile, there was a problem to find a source for funding health care for everyone until 1954 when the Fourth National Conference on Health in Colleges that

met in New York recommended that the cost of such services should be secured by the students in the form of a “health fee”. As of 1960, there was an increasing need to broaden the college health services spectrum, and more comprehensive programs were developed to also include mental health and counseling services. The main service providers were physicians and nurses, but some centers also added laboratories and pharmacies. The role of health centers was noticed to drastically increase in promoting health and preventing illness (17).

In 1965, UHS were strongly recommended by a WHO expert committee, and the report clearly described their scope ranging from dealing with physical and mental health issues to ensuring students’ health awareness (12). However, the committee did not clearly describe a particular standard structure for UHS because the latter needed to be tailored to the needs of the community and differed according to the settings (12).

In Lebanon, several universities have established offices, clinics, or centers to provide health care services for students. Not all universities have their services lucidly described on their website. The UHS at AUB was initiated in 1945 in a single room as part of the Internal Medicine department. Later, in 1949, it was extended and became an administrative part of the Faculty of Medicine. In mid-1995, the UHS became incorporated within the department of Family Medicine and is currently serving 150-200 patients daily (19).

The UHS at Beirut Arab University (BAU), was officially opened in September 2018 (20). The health provision at BAU was previously limited to a dispensary clinic with a full-time nurse, and a physician who was available on a part-time basis. Currently, family physicians are the main providers of health care for students and university community at both AUB and BAU.

2. Utilization of UHS

Published data on utilization of UHS by students is limited. The few studies published so far indicate that the epidemiological context as well as the composition of the student's population are major determinants. A study exploring the utilization of students' health services by international students in a university in Melbourne, Australia, found out that there is underutilization of these services. The average number of visits per student to health services clinics was two during Spring semester, and 2.2 to the counseling services clinics. Approximately 48% made a single visit to the health services and 60% made a single visit to the counseling services although a higher percentage reported the need for both kinds of services (21).

Another study from Ghana to assess the patterns of utilization of health services at a medical school showed that the most common conditions seen were malaria, respiratory tract infections, musculoskeletal conditions, skin diseases, and others. Results revealed seasonal patterns of common health conditions for which students consulted (2).

In Lebanon, a study was done to assess the health care seeking behavior of students in a university in Lebanon showed that students prefer to seek informal help for their health issues. Approximately 72% of students mentioned having physical problems in the past 12 months, and around 60% mentioned having psychological issues. (22).

CHAPTER III

METHODS

A. Study design

This is a descriptive case-series that involved a cohort of AUB students who were beneficiaries of UHS over three academic years. Anonymous data were obtained from the medical records of students who had their names registered in the AUB UHS for the three academic years 2015-2016, 2016-2017, and 2017-2018. These years preceded the installation of the EPIC health information system.

B. Settings and study sample

All AUB students who were registered for the whole study period extending from September 2015 and August 2018 were included in the study. The total number was around 9,000. AUB contains seven Faculties that offer undergraduate, graduate, and post-graduate studies. All students are offered free medical services in the UHS clinics housed and managed by the Family Medicine department. Most students are also enrolled in a health insurance plan (HIP) covering all expenses of in and out medical care. Students who can waive HIP are still eligible to access the UHS clinics, but not referrals to other specialties. UHS clinics are operated from Monday through Friday between 8:00 AM and 7:00 PM and Saturdays between 10:00 AM and 2:00 PM. Students can access the clinics on appointment or walk-in basis when needed. After being assessed by the family physician, students can be referred to other specialty care when needed. UHS data were extracted from Filemaker®, the software used as an electronic health record for all patients of the family medicine department.

The list of extracted variables included details of the visits and all information associated with it, excluding the physicians' notes. Each visit had a unique encounter number that was replaced by a different code to ensure all data is kept anonymous.

C. Definition of variables

Independent variables collected included visit dates, age at each visit, gender and faculty attended. Weight and height were registered at each visit and used to calculate the body mass index (BMI). Smoking status as a dichotomous variable is usually asked in each visit, and it was found missing for some students. If it was missing in all the encounters, then it was treated as a missing value. The same was done for missing values in other behavioral variables such alcohol intake. The diagnosis at time of visit and other co-morbidities were recorded, as well as laboratory tests requested, and referrals. Measures of utilization were considered as the dependent variables. These included the yearly and monthly number of visits, number of referrals, and number of laboratory tests done.

D. Data management

Data initially obtained as excel sheets could be examined from two perspectives; the utilizers' perspective and their pattern of utilization, and the institutional one associated with volume and types of services provided. The codes assigned for the utilizers and the visit encounters were used to merge the data sets. Pivot tables were used to obtain counts of the services provided per each utilizer over the three academic years.

E. Data analysis

Univariate description of various variables was presented as frequencies and percentages for categorical ones, and as means, medians and standard deviations (SD) for continuous ones. Independent samples t-test was used to test the association between utilization rates and the dichotomous variables. ANOVA test was used for variables that included more than two categories. Pearson's correlation was used for continuous variables. Multiple linear regression was performed for independent variables that were found significantly associated with the outcome variables. Variables that had a p-value of 0.2 or less were included in the models.

Utilization ratios were defined as the number of visits divided by the total number of students eligible to access UHS and were calculated as such. The variation of common diagnoses over time was illustrated using a heat diagram, where the color intensity related proportionately to the frequency of the diagnosis.

F. Ethical consideration

Ethical approval was obtained from the institutional review board of the American University of Beirut. Data used for analysis were anonymous. Medical records were not accessed at all. Instead, excel sheets including the required data was exported by the administrator of the Family Medicine department, and de-identified then analyzed.

CHAPTER IV

RESULTS

There were 2,483 students registered in the university throughout the three academic years of the study. Only 1,599 ever visited UHS during the three-year period. They became the numerator of the analysis.

A. Basic characteristics of the study cohort (Table 1):

The mean age of the students consulting UHS was 20.63±2.72. Females constituted 51.2% and males comprised 48.8%. Most of the students were non-smokers (75.98%), and non-alcohol-users (67.48%). The majority had a normal BMI (63.44%), and nearly a quarter were overweight (22.72%). Approximately half of the study cohort were students from the Faculty of Art and Science (49.59%), and 28.33% were registered in the Faculty of Engineering and Architecture. These numbers correspond to the number of student enrollment in the respective faculties.

Table 1. Personal characteristics of the study cohort (N=1,599)		
Variable		**n (%)**
Age (years)	Mean ± SD	20.63 ± 2.72
Gender	Male	775 (48.80)
	Female	813 (51.20)
Smoking Status	Smoker	337 (24.02)
	Non-smoker	1,066 (75.98)
Alcohol Intake	Yes	371 (32.52)
	No	770 (67.48)
BMI	Underweight	51 (4.53)
	Normal	715 (63.44)
	Overweight	256 (22.72)
	Obese	105 (9.32)
Faculty	Agriculture and Food Sciences	106 (6.63)
	Arts and Science	793 (49.59)
	Engineering and Architecture	453 (28.33)
	Health Sciences	57 (3.56)
	Medicine	117 (7.32)
	School of Business	49 (3.06)
	School of Nursing	24 (1.50)

B. Utilization patterns

1. Yearly visits

Table 2 shows the total number of visits distributed by academic year. The total number of visits and completed visits increased over the three years. While there were

3,205 total visits during the academic year 2015-2016, the number increased to 3,786 in 2016-2017, and 4,485 in 2017-2018. The percent of completed visits was almost the same over the three-year period (around 86%). The "No show" visits constituted around 7 to 8% of recorded visits.

Table 2. Total number of visits distributed by academic year

Variable	2015-2016 n (%)	2016-2017 n (%)	2017-2018 n (%)	Total N (%)
Completed Visits	2,786 (86.93)	3,279 (86.61)	3,843 (85.69)	9,908 (86.34)
Cancelled Visits	175 (5.46)	238 (6.29)	291 (6.49)	704 (6.13)
No Show Visits	244 (7.61)	269 (7.11)	351 (7.83)	864 (7.53)
Total	3,205	3,786	4,485	11,476

Academic year extends from September to August

2. Utilization ratios

Table 3 shows the student distribution by the average number visits to UHS per year. Students who never showed to the UHS were 924, constituting 37.2% of the total number of students eligible to access UHS (N=2,483). Five hundred forty-eight students (22.07%) visit the UHS at least twice yearly in average.

Table 3. Distribution of students by number of yearly visits to UHS

Average number of visits per year	Students n (%)
Zero visits	924 (37.2)
More than zero to one	647 (26.05)
More than one to two	340 (13.69)
More than two	548 (22.07)

N=2,483 students

Mean number of visits = 1.3 per year

Table 4 shows the utilization ratio of UHS. The latter increased from 1.12 visit per student in 2015-2016 to 1.32 in 2016-2017, reaching 1.54 in 2017-2018. The utilization ratio was calculated by dividing the number of "completed visits" over the total number of students eligible to access UHS (N=2,483). Of the students who used the UHS services, 290 (18.1%) visited the clinics once only in three years.

The "no show" visits nevertheless consume allocated time and create a particular type of stress on the system. When calculating the utilization ratio including the "completed" and "no show" visits in the numerator, the average utilization ratio increased from 1.33 (without "No show") to 1.45. This indicates that there is an average of 8% wasted appointments due to the "no show" visits.

Table 4. Utilization ratio of UHS clinics

Academic Year^	2015 - 2016	2016 - 2017	2017 - 2018	Average
Number of "Completed" Visits	2,786	3,279	3,843	3,303
Utilization Ratio for "Completed" Visits	**1.12**	**1.32**	**1.55**	**1.33**
Number of "Completed" and "No Show" Visits	3,030	3,548	4,194	3,591
Utilization Ratio for "Completed" and "No Show" Visits	**1.22**	**1.43**	**1.69**	**1.45**
Wasted Utilization (%)	8.06	7.58	8.37	8.02

Utilization ratio is the number of visits divided by the total number of students eligible to access UHS (N=2,483)

Academic year extends from September to August

3. Daily variations of visits

There were no distinct variations over the 5 weekdays Monday through Friday, and only 1.2% of the visits were on Saturdays as shown in Figure 1.

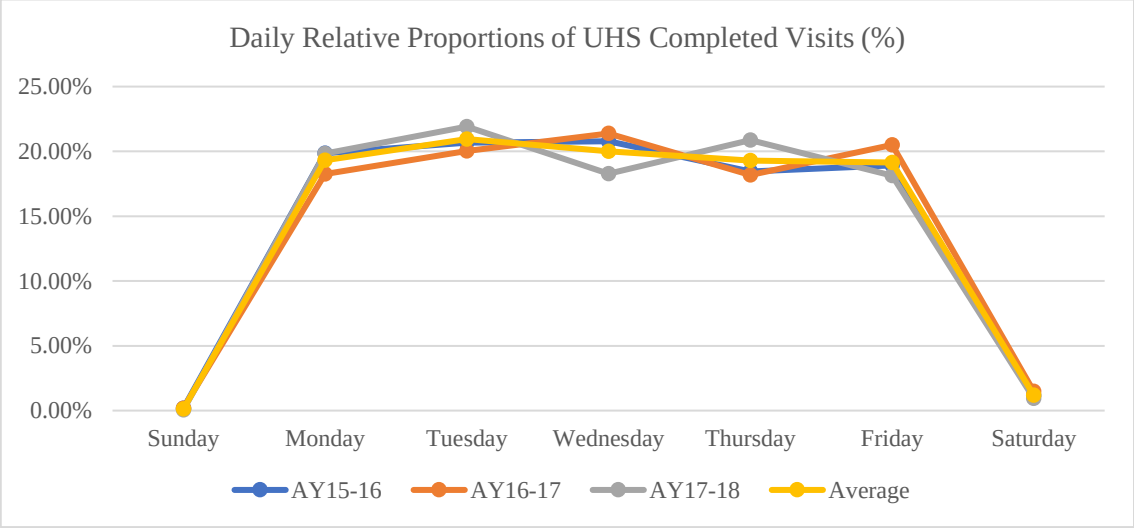


Figure 1. Daily Relative Proportions of UHS Completed Visits

4. Monthly variation of visits

Further analysis on monthly distribution of the visits shows a particular pattern over the three academic years. While the visits decrease in the month of December of each year (average of 6.21% of the yearly visits), there was a noticeable increase of visits during February (9.42%) and March (10.41%). The rate of visits remains stable during Spring to decrease again in July reaching 6.48% (Figure 2).

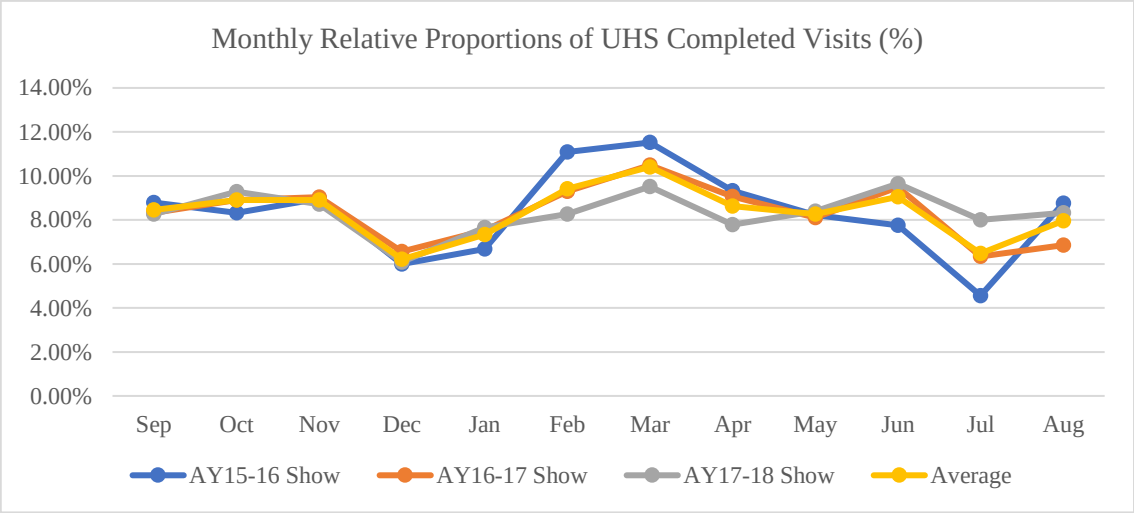


Figure 2. Monthly Relative Proportions of UHS Completed Visits

5. Students' personal characteristics and utilization patterns

When studying the association between students' basic personal characteristics and the number of completed visits over the three-year period (table 5), older age was shown to be significantly associated with higher number of visits. Another significant finding is that female students had more UHS visits as compared to males (p-value <0.001). Also, students from the health-related faculties: medicine, nursing, and health sciences, had significantly more visits to UHS as compared to students from other faculties (p-value < 0.001).

Table 5. Association between students' personal characteristics and number of completed visits

Variable		**n (%)**	**Number of Visits (Mean* ± SD)**	***P-Value***
Age	Mean ± SD	20.63 ± 2.72	*r* = 0.085	**<0.001**
Gender	Male	775 (48.8)	5.64 ± 6.26	**< 0.001**
	Female	813 (51.2)	6.78 ± 6.49	
Smoking Status	Smoker	337 (24.02)	6.68 ± 6.28	0.74
	Non-smoker	1,066 (75.98)	6.81 ± 6.63	
Alcohol Intake	Yes	371 (32.52)	7.19 ± 7.11	0.62
	No	770 (67.48)	6.98 ± 6.93	
BMI	Underweight	51 (4.53)	7.39 ± 5.83	0.68
	Normal	715 (63.44)	6.78 ± 6.63	
	Overweight	256 (22.72)	6.64 ± 6.46	
	Obese	105 (9.32)	7.42 ± 6.57	
Faculty	Agriculture and Food Sciences	106 (6.63)	5.34 ± 5.17	**<0.001**
	Arts and Science	793 (49.59)	6.02 ± 5.88	
	Engineering and Architecture	453 (28.33)	5.53 ± 6.98	
	Health Sciences	57 (3.56)	7.43 ± 6.36	
	Medicine	117 (7.32)	10.52 ± 7.25	
	School of Business	49 (3.06)	4.4 ± 4.97	
	School of Nursing	24 (1.5)	7.7 ± 5.57	

*The mean of completed visits in three academic years
N=1,559 students

Table 6 shows the association between students' basic characteristics and the rate of "No show" visits. Females had significantly higher "No show" visits than males (p value < 0.001) in the bivariate analysis. Students who smoke had significantly more

"No show" visits than those who do not (p-value = 0.003). These associations persisted after adjusting for the number of actual visits.

Table 6. Association between students' personal characteristics and number of "No Show" visits

Variable		**n (%)**	**"No Show" Visits Mean ± SD**	***P-Value***
Age	Mean ± SD	20.63 ± 2.72	*r* = -0.11	0.64
Gender	Male	775 (48.8)	0.42 ± 0.91	**<0.001**
	Female	813 (51.2)	0.66 ± 1.33	
Smoking Status	Smoker	337 (24.02)	0.78 ± 1.31	**0.003**
	Non-smoker	1,066 (75.98)	0.54 ± 1.16	
Alcohol Intake	Yes	371 (32.52)	0.70 ± 1.34	0.11
	No	770 (67.48)	0.57 ± 1.19	
BMI	Underweight	51 (4.53)	0.58 ± 1.38	0.94
	Normal	715 (63.44)	0.57 ± 1.14	
	Overweight	256 (22.72)	0.63 ± 1.42	
	Obese	105 (9.32)	0.6 ± 1.09	
Faculty	Agriculture and Food Sciences	106 (6.63)	0.51 ± 0.95	0.76
	Arts and Science	793 (49.59)	0.52 ± 1.1	
	Engineering and Architecture	453 (28.33)	0.52 ± 1.18	
	Health Sciences	57 (3.56)	0.61 ± 1.06	
	Medicine	117 (7.32)	0.67 ± 1.48	
	School of Business	49 (3.06)	0.42 ± 0.73	
	School of Nursing	24 (1.5)	0.75 ± 1.62	

N=1,559 students

C. Characteristics of visits to the UHS clinics

1. Reasons of visiting UHS

The vast majority of the students' visits to UHS clinics were for a health complaint or illness (74.49%), while 7.62% of the visits were for immunization, 5.33% for advice and health instructions, 3% for referral only, and only a minority for filling medical forms (1.53%) as shown in Table 7.

Table 7. Reasons of visits to the UHS clinics

Reason of visit	n (%)
Health Complaint	4,924 (74.49)
Advise and Health Instructions	352 (5.33)
Checking Lab Results	237 (3.59)
Filling Medical Forms (letter, forms, prescription wo exam)	101 (1.53)
Immunization	504 (7.62)
Medical Exam (including medical exam and pre-employment)	290 (4.39)
Referral only	202 (3.06)

N=6,610 which represents all diagnostic codes associated with the study cohort over three years

2. Common diagnoses of the visits

The students' visits were grouped based on the diagnosis categories mentioned on the records (Table 8). It was found that approximately 18% of the total diagnoses were related to health maintenance and approximately 16% of diagnoses were under "Dermatology". Respiratory, gastrointestinal, musculoskeletal complaints, in addition to immunization also formed around 7 to 8% of visits' diagnoses each. Neoplasm category constituted less than 0.1% of visits' diagnoses.

The most common mentioned diagnoses of the UHS visits that took place for a health complaint are illustrated in table 9. Acne and other dermatological disorders head the list with 8.77% and 4.63% respectively. Acute upper respiratory infection was the

third most common diagnosis (4.16%) followed by abdominal pain (2.58%) and diarrhea (2.46%).

Table 8. Diagnosis categories of the students visits to the UHS clinics

Diagnosis Category	n (%)
Health Maintenance	1,182 (17.88)
Dermatology	1,046 (15.82)
Respiratory	522 (7.90)
Gastrointestinal	521 (7.88)
Immunization	504 (7.62)
Musculoskeletal	485 (7.34)
Neurology	335 (5.07)
Psych/Behavioral	290 (4.39)
Infectious	268 (4.05)
Accidents	234 (3.54)
General Signs and Symptoms	231 (3.49)
Cardiovascular	177 (2.68)
Genitourinary	135 (2.04)
GYN	127 (1.92)
Metabolic	119 (1.80)
Obstetrics	109 (1.65)
ENT	108 (1.63)
Blood Disorder	97 (1.47)
Renal	53 (0.80)
Ophthalmology	52 (0.79)
Supplemental Classification	10 (0.15)
Neoplasm	5 (0.08)

N=6,610 which represents all diagnostic codes associated with the study cohort over three years

Table 9. Most common diagnoses of the students presenting with a health complaint to UHS

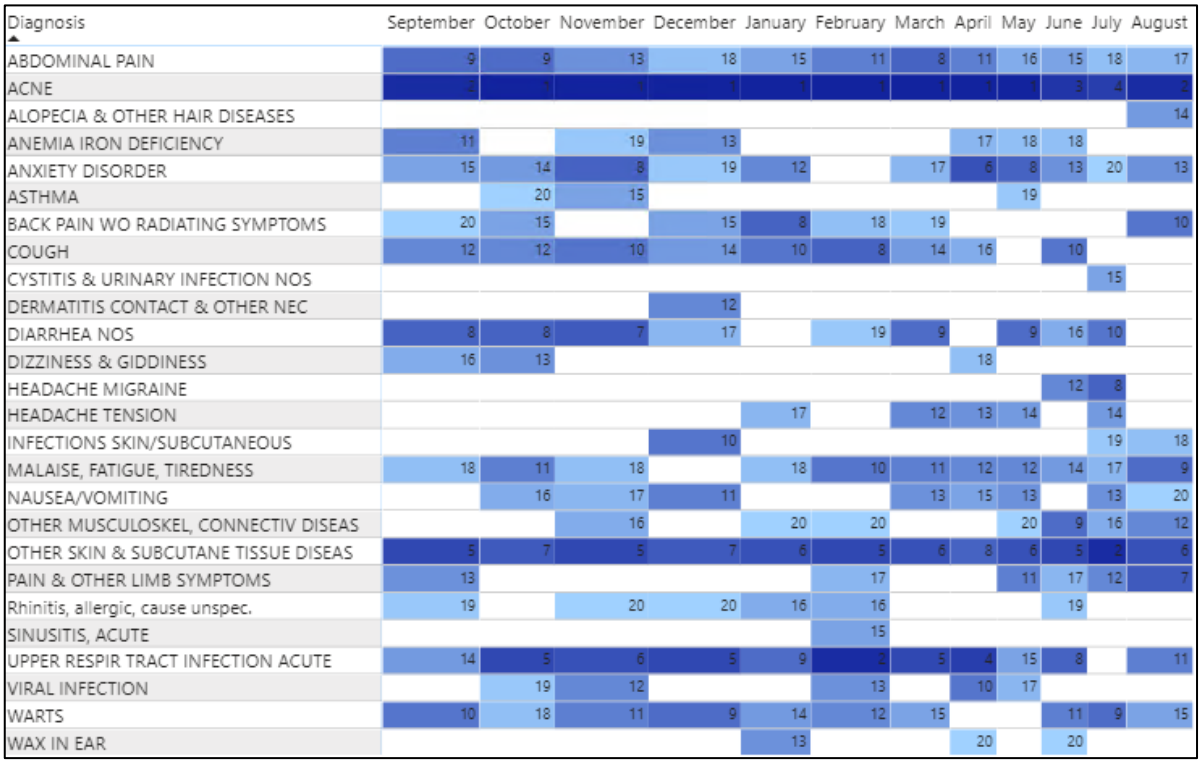
Diagnosis	n (%)
Acne	432 (8.77)
Other Skin and Subcutaneous Tissue Diseases	228 (4.63)
Acute Upper Respiratory Tract Infection	205 (4.16)
Abdominal Pain	127 (2.58)
Diarrhea Not Otherwise Specified	121 (2.46)
Anxiety Disorder	118 (2.4)
Malaise, Fatigue, Tiredness	117 (2.38)
Cough	114 (2.32)
Warts	112 (2.27)
Nausea/Vomiting	92 (1.87)
Back Pain Without Radiating Symptoms	87 (1.77)
Headache Tension	84 (1.71)
Iron Deficiency Anemia	82 (1.67)
Other Musculoskeletal, Connective Diseases	82 (1.67)
Pain and Other Limb Symptoms	81 (1.65)
Viral Infection	77 (1.56)
Dizziness and Giddiness	76 (1.54)
Migraine Headache	69 (1.40)
Rhinitis, Allergic, Cause Unspecified	63 (1.28)
Depressive Disorder	60 (1.22)

N=4,924 which represents all diagnoses of health complaint category in three academic years

3. Monthly variation of diagnoses

Figure 3 represents the monthly variation of the most common diagnoses, were the color gradient is proportional to the frequency of the diagnosis. In other words, the darker the color gradation, the higher the frequency of diagnosis during the respective month. This is clarified by the ranking labels inside the cells (a rank of 1 implies that the diagnosis is the most frequent during the month).

Most of the diagnoses exhibited some sort of stability over the different months of the year. However, there was some noticed variation in some diagnoses like upper respiratory tract infections that were recorded more from October to December and February to April. Another example is dermatitis that appeared in the top 20 diagnoses in December only.



Diagnosis	September	October	November	December	January	February	March	April	May	June	July	August
ABDOMINAL PAIN	9	9	13	18	15	11	8	11	16	15	18	17
ACNE	2	1	1	1	1	1	1	1	1	3	4	2
ALOPECIA & OTHER HAIR DISEASES												14
ANEMIA IRON DEFICIENCY	11		19	13				17	18	18		
ANXIETY DISORDER	15	14	8	19	12		17	6	8	13	20	13
ASTHMA		20	15						19			
BACK PAIN WO RADIATING SYMPTOMS	20	15		15	8	18	19					10
COUGH	12	12	10	14	10	8	14	16		10		
CYSTITIS & URINARY INFECTION NOS											15	
DERMATITIS CONTACT & OTHER NEC				12								
DIARRHEA NOS	8	8	7	17		19	9		9	16	10	
DIZZINESS & GIDDINESS	16	13						18				
HEADACHE MIGRAINE										12	8	
HEADACHE TENSION					17		12	13	14		14	
INFECTIONS SKIN/SUBCUTANEOUS				10							19	18
MALAISE, FATIGUE, TIREDNESS	18	11	18		18	10	11	12	12	14	17	9
NAUSEA/VOMITING		16	17	11			13	15	13		13	20
OTHER MUSCULOSKEL, CONNECTIV DISEAS			16		20	20			20	9	16	12
OTHER SKIN & SUBCUTANE TISSUE DISEAS	5	7	5	7	6	5	6	8	6	5	2	6
PAIN & OTHER LIMB SYMPTOMS	13					17			11	17	12	7
Rhinitis, allergic, cause unspec.	19		20	20	16	16				19		
SINUSITIS, ACUTE						15						
UPPER RESPIR TRACT INFECTION ACUTE	14	5	6	5	9	2	5	4	15	8		11
VIRAL INFECTION		19	12			13		10	17			
WARTS	10	18	11	9	14	12	15			11	9	15
WAX IN EAR					13			20		20		

Figure 3. Monthly variation of common diagnoses

D. Referrals by UHS clinics to other specialties

1. Number and patterns of referrals issued

The total number of referrals issued by the UHS clinics showed to increase from 546 in 2015-2016 to reach 1,028 in 2017-2018. The referral to visit ratio, defined as the number of referrals per year divided by number of completed visits to UHS clinics in the same period also increased from 0.2 in the first year to 0.27 in the third year. The average referral to visit ratio is 0.24 (Table 10).

Table 10. Number of referrals and their ratio to the number of completed visits over the three academic years

Academic Year^	Number of Referrals	Number of Completed Visits	Referral to Visit Ratio
2015 - 2016	546	2,786	0.20
2016 - 2017	790	3,279	0.24
2017 - 2018	1,028	3,843	0.27
Total	2,364	9,908	0.24

Table 11 shows the distribution of specialty referrals given to students at UHS. The most common specialties to which students visiting UHS were referred are psychiatry and ophthalmology. Referrals to psychiatry constitute around one third of the total referrals (30.66%), while one quarter of the referrals were to ophthalmology (25.16%). On the other hand, referrals to orthopedics and obstetrics and gynecology accounted for 7.45% and 6.23% of total referrals, respectively. A significant difference is noted between the referrals given to male students and female students in psychiatry, orthopedics, and endocrinology. Females received more referrals to endocrinology specialists but less referrals to psychiatry and orthopedics specialists.

Table 11. Specialty distribution of the referrals issued by UHS clinics

Specialty	Male Students n (%)	Female Students n (%)	Total n (%)	P-value
Psychiatry	363 (34.15)	361 (27.81)	724 (30.63)	**0.01**
Ophthalmology	272 (25.59)	322 (24.81)	594 (25.13)	0.66
Orthopedics	102 (9.60)	74 (5.70)	176 (7.45)	**<0.001**
Obstetrics/Gynecology	2 (0.19)	145 (11.17)	147 (6.22)	**<0.001**
Ear Nose and Throat	47 (4.42)	47 (3.62)	94 (3.98)	0.32
Gastroenterology	39 (3.67)	52 (4.01)	91 (3.80)	0.67
Dermatology	38 (3.57)	51 (3.93)	91 (3.85)	0.65
Neurology	26 (2.45)	40 (3.08)	66 (2.79)	0.35
Endocrinology	5 (0.47)	50 (3.85)	55 (2.33)	**<0.001**
General Surgery	24 (2.26)	21 (1.62)	49 (2.07)	0.08
Cardiology	24 (2.26%)	20 (1.54)	44 (1.86)	0.20
Urology	27 (2.54%)	5 (0.39)	32 (1.35)	**<0.001**
Others	90 (8.47%)	110 (8.47)	201 (8.50)	0.99

N=2,364 which represents all referrals issued by UHS clinics over three years (Males=1,063, Females=1,298)

Missing values in the gender of three students

2. Association between students' characteristics and number of referrals used

When assessing the association between students' basic characteristics and the number of referrals given, the BMI was found to be a significant predictor (Table 12). Obese patients significantly received more referrals than others (p= 0.04).

Table 12. Association between students' personal characteristics and the number of referrals given to students

Variable		n (%)	Referrals* Mean ± SD	*P-Value*
Age	Mean ± SD	20.63 ± 2.72	r = 0.05	**0.028**
Gender	Male	775 (48.80)	1.37 ± 2.78	0.11
	Female	813 (51.20)	1.60 ± 2.97	
Smoking Status	Smoker	337 (24.02)	1.80 ± 3.37	0.24
	Non-smoker	1,066 (75.98)	1.57 ± 2.88	
Alcohol Intake	Yes	371 (32.52)	1.88 ± 3.30	0.08
	No	770 (67.48)	1.57 ± 2.58	
BMI	Underweight	51 (4.53)	1.62 ± 2.59	**0.04**
	Normal	715 (63.44)	1.53 ± 2.66	
	Overweight	256 (22.72)	1.69 ± 3.17	
	Obese	105 (9.32)	2.39 ± 3.74	
Faculty	Agriculture and Food Sciences	106 (6.63)	1.03 ± 1.95	0.17
	Arts and Science	793 (49.59)	1.49 ± 2.8	
	Engineering and Architecture	453 (28.33)	1.52 ± 3.42	
	Health Sciences	57 (3.56)	1.35 ± 1.93	
	Medicine	117 (7.32)	1.99 ± 2.62	
	School of Business	49 (3.06)	0.85 ± 1.48	
	School of Nursing	24 (1.50)	1.16 ± 2.05	

Average number of referrals given in three years per student

E. Utilization of laboratory services

1. Cost estimates of the laboratory tests

The cost of laboratory tests showed to increase over the three academic years. Considering the total number of 1,599 student who used UHS services, the estimated laboratory expenses per student ranged from around 13 USD in the first academic year of the study to 26 USD yearly in the third year. The toral expenses of all lab tests done in the three years reached approximately 98,000 USD.

Table 13. Estimated expenditure on laboratory tests

Academic Year	Total Estimated Expenditure in USD	Estimated Expenditure per Student in USD
2015 - 2016	20,596.97	12.88
2016 - 2017	36,325.50	22.72
2017 - 2018	40,865.72	25.56
Total	97,788.18	61.16

Costs of lab tests were calculated according to the NSSF rates

1USD = 1,515 LBP

2. Association between students' characteristics and laboratory cost estimates

In the bivariate analysis (table 14), age was significantly associated with the estimated expenses on laboratory tests. The older the student, the higher is the cost of the laboratory tests done ($r=0.11$, $p < 0.001$). Also, the expenses of the laboratory tests ordered for females were significantly higher than those of males over the three-year period ($p< 0.001$). Additionally, the expenses of laboratory tests done by students who do not smoke were significantly higher than those of smokers ($p= 0.024$). Moreover, obese, and underweight students had significantly more laboratory tests expenses than students with normal or overweight BMI ($p= 0.012$). Finally, the expenses of laboratory

tests done by students from faculties of Medicine, Nursing, and Health Sciences were significantly higher than other faculties ($p< 0.001$).

Table 14. Association between students' personal characteristics and estimated expenditure on laboratory tests

Variable		**n (%)**	**Expenditure Estimates* in USD (Mean ±SD)**	***P-Value***
Age	Mean ± SD	20.63 ± 2.72	r = 0.11	**<0.001**
Gender	Male	775 (48.8)	41.94 ±92.95	**<0.001**
	Female	813 (51.2)	80.20 ±127.65	
Smoking Status	Smoker	337 (24.02)	56.02 ±113.26	**0.024**
	Non-smoker	1066 (75.98)	72.28 ±119.75	
Alcohol Intake	Yes	371 (32.52)	63.6 ±111.17	0.186
	No	770 (67.48)	73.5 ±122.01	
BMI	Underweight	51 (4.53)	100.00 ±140.52	**0.012**
	Normal	715 (63.44)	69.45 ±123.35	
	Overweight	256 (22.72)	58.16 ±96.13	
	Obese	105 (9.32)	97.37 ±143.65	
Faculty	Agriculture and Food Sciences	106 (6.63)	74.02 ±141.51	**<0.001**
	Arts and Science	793 (49.59)	56.13 ±101.78	
	Engineering and Architecture	453 (28.33)	51.55 ±108.91	
	Health Sciences	57 (3.56)	91.91 ±112.50	
	Medicine	117 (7.32)	110.37 ±159.90	
	School of Business	49 (3.06)	28.40 ±63.91	
	School of Nursing	24 (1.5)	105.34 ±145.02	

*Represents the expenses in three academic years

Age, gender, smoking status, alcohol intake, BMI, faculty, and actual visits to UHS were all entered a multiple linear regression model (Table 15) and they were shown to explain 33.5% of the variation of the costs of the laboratory tests done over the three academic years. The regression model is statistically significant with p <0.001 showed that female gender, old age, and number of actual visits are significant predictors of the estimated expenditure on laboratory tests.

Table 15. Multiple linear regression analysis of the factors affecting expenditure on lab tests

Variables/Predictors	**B**	**95% CI for B**	***P-value***
Constant/Intercept	-92.54	(-147.99, -37.09)	0.001
Age	2.65	(0.41,4.89)	**0.02**
Gender	23.9	(11.08,36.72)	**<0.001**
Smoking Status	-8.06	(-22.88,6.75)	0.28
Alcohol Intake	-12.32	(-25.72,1.08)	0.07
BMI Category	1.37	(-7.33,10.07)	0.75
Faculty	2.45	(2.70,7.61)	0.351
Actual Visits	9.85	(8.93,10.76)	**<0.001**

Dependent variable: Cost of lab tests done in three academic years in USD

R2= 0.335, p <0.001

CHAPTER V

DISCUSSION

A. Main study findings

This study of UHS clinics found that the utilization ratio in a cohort of students followed up over three academic years increases with students' age over time. Each student visited UHS 1.3 times yearly on average. However, 37.2% of eligible students never showed to the UHS, and around 18% of the utilizers presented to UHS only once in the three years. Females did significantly more visits than males, a finding that is similar to universal findings regarding the general utilization of health care (26). In general, most diagnoses were related to health maintenance, followed by dermatological complaints. Most of the referrals were made to psychiatry, followed by ophthalmology and orthopedics. Gender differences appeared in this regard, with predominance of orthopedic referrals for males and endocrinological referrals for females. These differences are expected among young adults generally in good health.

A seasonal distribution was detected, marked by a higher peak in winter and a lower dip in summer. This seasonal pattern is expected, and it can be linked to the higher incidence of acute respiratory infections and a back-log in routine tests to be obtained during the winter months. This pattern though differs by area (2) and needs to be interpreted cautiously. Utilization did not vary during the weekdays. Medical students, and students of other health-related faculties, had significantly more visits to UHS than students from other faculties. Expenditures on laboratory tests increased over the three academic years. Older age, female gender, and actual number of completed visits were found to be predictors of higher expenditures.

B. Age and utilization

Older age is a universal predictor of increased utilization of health care. However, the span of time spent at university is too short. Therefore, the link between older age and increase in UHS utilization cannot be attributed to a general deterioration of health linked to ageing. More likely the link is an indicator of students' improved familiarity with UHS services and procedures. The lower rate of UHS utilization in the first academic year may be related to difficulties of incoming students in managing their time to visit UHS when needed. Another possible reason is that the senior students may decide to make use of the "prepaid" credit to avail themselves of useful services before losing their (HIP) after graduation. The fact that freshman students may not be utilizing the services as needed should be addressed.

C. Utilization by students' disciplines

The fact that students from health-related disciplines make significantly more visits to the PHC than students from other faculties may be due to better orientation to health issues and clinical procedures. One may argue that the increased level of utilization is simply due to the geographical proximity of the health campus to the UHS clinic, compared with the largest faculties: Arts and Sciences, Engineering and Agriculture. Previous studies indicated that distance to a health facility affects its use in open target populations (2, 23), and inadequate means of transportation can be a barrier to seeking health care by students in Lebanon (22). A possible problem related to the various dimensions of location of the services within campus may have to be further explored.

Another argument would be the acquired familiarity of health-related students with issues of health and disease and with procedures during their rotations.

Finally, it is important to remember that students in Medicine, and in large proportions in Nursing and Public Health are older, graduate students, often previous undergraduate students in the same university. This historical relationship with AUB has already been demonstrated as a factor of higher utilization.

D. Referrals from UHS

Additionally, the current study found that referrals were given in approximately 24% of the total number of visits, a rate that is higher than the findings in the literature where referrals are issued in less than 20% of encounters in family medicine (24). Most of the referrals were issued to psychiatry, followed by ophthalmology and orthopedics. The former can be accounted to the high prevalence of depression, anxiety, eating disorders, and other psychiatric problems among university students (5, 22, 25, 26). The ophthalmology referrals can be a consequence of the HIP system that allows students to benefit from a yearly vision check-up. They can also be linked to the fact that more than half of AUB students have refractive errors, and approximately two-thirds of them have asthenopia mainly due to the increased use of digital devices (27).

The results of the current study also showed that obese students significantly receive more referrals than others with normal or overweight BMI. This is most probably related to increased probability of chronic conditions associated with obesity, unhealthy eating habits, and sedentary life (28).

The most common diagnoses of the UHS visits fall under immunization, advice and health instruction, and medical exam. These categories which consume a large

volume of health activities, are nevertheless very important and fall within the PHC mandate of health promotion and disease prevention.

Dermatological complaints were high on the list of diagnoses, particularly acne. This finding, which is in conformity with what was reported elsewhere (2), is related to basic epidemiological features of young adults. Stress-related dermatologic problems, including acne vulgaris are quite common among university students, and may affect their educational performance and quality of life (29). The preponderance of skin conditions among UHS visits' reasons opens door for further plans.

On a different note, the wide array of diagnoses seen in the UHS clinics can be a great opportunity for the training residents and medical students. The latter fact tells that UHS is not only a need to improve the health of the University population, but also an opportunity for universities that include health related faculties. Residents and other healthcare students who train in these settings would be qualified to provide high quality care to university students in similar settings. The variation seen in diagnoses should be considered by faculty members in charge of training of residents. The yearly residents' schedule needs to be balanced in a way that ensures proper exposure to all conditions.

E. Limitations of the study

This pioneering study in university healthcare services in the Arab World may be affected by some limitations. In particular, the database analyzed did not include the utilization of emergency services and in-patient services, which are recorded at point of service outside UHS. Students' medical records were sometimes incomplete, as many visits lacked a definite diagnosis. Finally, no information regarding radiology testing

was included in the data, as radiology requests were paper based during the study period.

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

Several practical recommendations stem from the analysis presented above.

1. The analysis of determinants associated with UHS utilization cannot be complete without taking into account the psychosocial factors of potential utilizers. Any future study should therefore include a direct assessment of students' awareness, perceptions, opinions, beliefs, and expectations concerning health care in general and at the university clinic in particular.

2. To improve the utilization of UHS by first-year students, a structural mandate has to be developed. For example, the gap can be closed by including UHS information in the routine orientation sessions received by the incoming class, and/or by rendering a first check-up visit mandatory upon matriculation. These strategies can improve the awareness of students regarding the range of services available and the procedures to be followed.

3. Establish procedures that can decrease the burden of no-show on the system. This could include sending reminders or overbooking based on the reported rates of no-show.

4. The monthly variation of activity volume should be used to allocate resources properly. Physicians can be advised to take their yearly vacations during the

months of low expected visits if the physicians are full timers. Another way is to increase the capacity during busy months with the help of part-time physicians.

5. The location of the UHS clinics within a university needs to be thoroughly studied to ensure more proximity to all faculties.

6. The role of UHS as a training center for future PHC practitioners should not be neglected. Data obtained here on most common diseases diagnosed, and most common causes of referral indicate for example that Family Medicine (FM) residents who are anticipated to be part of a UHS program need to receive additional training on common psychiatric, dermatological, and orthopedics conditions.

7. Any improvement on the quality, consistency and completeness of data obtained will contribute to more valid evaluation of the services at UHS. The recent adoption of the EPIC program will very likely constitute a major step in this direction. Periodical monitoring of accumulated data should be considered as part of the routine functioning of this health information system at AUB and in all other academic centers with similar structures.

In conclusion, a UHS center serves a basic and essential purpose for the health and well-being students. Beyond its basic curative role, it can provide those students with knowledge and skill necessary to stay healthy in future life. The UHS is also a very important center for training of PHC practitioners, especially FM residents. The rotation

should be enhanced so that no opportunity for learning is wasted through easy referral or loss of information from data loops that are not well closed. Finally, data accumulated at FHS are important sources to be minded to address several research issues of importance regarding the health of adolescents and young adults.

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