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Original Article

Health Professional Students' Preparedness for E-Health

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Abstract

Background: E-Health is one of the recent major developments in health-care provision. Today's health professional students are considered digitally oriented, and this may endow them with the necessary capabilities to implement E-Health on graduation. **Aim:** This study aimed to assess students' views, use, confidence, and need for training on E-Health. **Participants:** Fourth-, 5th- and internship-year students of the medical and dental schools at the Libyan International Medical University constituted the study population. **Methodology:** This is a cross-sectional study conducted using an online administered survey. Prior to implementation, the questionnaire was reviewed by experts and then piloted on a group of research-targeted students. Likert scale was used for most questions and few were in the form of short answers. Descriptive statistics were reported using SPSS software version 23.0. **Results:** One hundred and two students responded, and all responders were included for most select-response questions. The male-to-female ratio was 2:3, with a mean age of 24 ± 1.8 years. Medical students accounted for 52% of the participants. An average of 45% reported proficiency in written and spoken English. Only 12% have taken IT-related courses. Their view on E-Health was moderately positive with a mean of 3.5 ± 0.34 of 3.1 ± 1.029. In spite of this, 43% ± 3.9% had negative views on E-Health. Nearly 58% of the participants used digital tools and software with a mean score of 2.43 ± 0.6. Most students reported using social media, especially Facebook (mean 4.95 ± 1.7). The students reported a confidence level of information and communication technology (ICT) use of 3.4 ± 1.2. They also described their confidence in learning a new technology with a value of 3 ± 0.3. Almost 32.9% of the participants expressed an overall need for training on ICT tools. **Conclusion:** The overall preparedness of this group for ICT is moderate and needs improvement. This could be achieved through introducing changes in the taught curriculum.

Keywords: E-Health, health professional, information and communication technology, learning confidence

Introduction

The term E-Health is variably defined and used as it is the case with new terminologies. It is almost impossible to reach an unanimous definition of eHealth.[1] eHealth is defined by the WHO, in very simple terms, as "the use of information and communication technologies for health."[2] This definition, though simple, is wide and without clear boundaries. In spite of this uncertainty, the term is firmly grounded in academic literature.

Eighty-five percent of the member states of the United Nations have an eHealth strategy and 55% have a legislation to protect patient data.[2] The implementation of eHealth facilitates communication between patients and health-care professionals as it is the case in managing diabetes mellitus, cardiac disease, smoking, and cancer prevention.[3-6]

One of the main aims of eHealth is to improve health-care efficiency and cost-effectiveness. Liaw *et al*. found out that clinical governance could be supported by clinical record systems as clinical indicators of eHealth. On the other hand, an eHealth web application for laboratory information system was designed and implemented in order to gather laboratory results to monitor HIV epidemic.[7] Besides, computer-based interventions have been used to provide self-management training in order to increase cost-effectiveness to patients with Type 2 diabetes.[8]

Strategies used to implement eHealth vary from using traditional methods to the use of mobile application for disease management, monitoring, and decision-making.[9,10]

Some of the developing countries are already taking initiatives in implementing eHealth. Kenya, for example, has multiple

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initiatives in this regard even though its efficacy was evaluated only sparingly.[11] Telemedicine is highly recommended for developing countries because of the scarcity of health professional numbers and the need for distance consultations.[12]

For all these reasons, health professionals need to learn and practice using information and communication tools in the setting of health-care delivery. Unfortunately, intended competencies for health profession graduates mostly do not emphasize the need for mastering information and communication technology (ICT) tools in the context of health care. At best, the competency of using ICT is vaguely mentioned.[13]

Current students are expected to be masters of technology tools because they are generally considered as digitally native. These students grew up in a world of digital equipment, and they are using ICT in their daily life. It could be speculated that these students will be naturally capable of using ICT once graduated from health professional schools. On contrary, it was found that there is no good correlation between student mastery of ICT and their preference for using their ICT skills in learning. It is also not clear whether health profession students are capable of transferring their skill of using social media to the real world of health service. This study aims at assessing students' knowledge of eHealth, their general use of ICT tools, and their confidence in transferring this knowledge to the health-care services upon graduation.

Methodology

Setting

This study was conducted at Libyan International Medical University (LIMU).

Participants

The study population comprised 4th-, 5th-, and internship-year students at medical and dental schools (DSs).

Type of the study

This was a cross-sectional descriptive study.

A questionnaire published by Lam *et al*., 2016,[14] was reviewed by the authors and adopted to the local context. It was then further reviewed by four high-rank academics who suggested some changes. The changes were made and an online form using Google Forms was prepared. It was then piloted by a small group of students who belong to the student population under study. Their suggestions were taken into account and the questionnaire was modified accordingly. The link to the final form of the questionnaire was then distributed to the participants through Facebook groups and Moodle. Each student was allowed one entry either through Facebook or Moodle. The questionnaire was available to participants for 12 weeks (from December 24, 2017, to February 24, 2018).

Questionnaire description

It included 111 anonymous questions divided into the following five sections: demographic data (Section I), students' knowledge of eHealth (Section II) using open-ended questions, students' view of eHealth (Section III) using a 4-point Likert scale, use of ICT (Section IV) using a checklist and time category sheet to select from, and confidence in using ICT software and devices for eHealth (Section V) through a 4-point Likert scale. Because of interdependence of Sections 2 and 3, it was made impossible to access Section 3 before completing Section 2.

Statistics

An IBM SPSS Statistics for Windows, Version 23.0. (Armonk, NY: IBM Corp., USA) was used in the analysis. Counts and percentages were used to express results for Sections I and IV. Section II was analyzed by grouping responses into themes. Means and standard deviation were used to express results in Section III. Counts, percentages, and unpaired *t*-test were used for Section V. $P < 0.05$ was considered statistically significant. Essay responses were theme categorized.

Ethical issues

The study protocol was presented to the Ethical Committee at LIMU and approval was obtained. Students' participation was voluntary and answering the questionnaire is considered as a consent to participate.

Results

Section I: General and demographic data

A total of 102 students responded, giving an overall response rate of 47.4%. Fifty-three (51.9%) respondents were from the faculty of medicine and the rest were from DS. Year distribution by faculty is shown in Table 1. The mean age of the respondents was 24.06 ± 1.792 years and females formed 70.6% of all respondents. Nearly 85.4% of the students reported that they are either proficient or very proficient in written and spoken English, with a mean of 3.4 ± 0.51 on a 5-point Likert scale. Eighty-eight percent of the students did not take any IT-related courses. The courses taken by the remaining 12 students included International Computer Driving License, power point, and programming.

Section II: Students' knowledge of eHealth

The 85 responses in this section were divided into five themes, two of these were discarded because of nonrelevance (ten responses). The nonrelevant themes were about university studies of IT and the other were about the use of TV programs for health promotion. The remaining 75 responses were grouped into the following themes: use of ICT in providing medical care reported by thirty, no knowledge by forty, and organization of patient data by five respondents.

Table 1: Frequency distribution of students by faculty and year, *n* (%)

	4th year	5th year	Internship
Faculty of medicine	43 (81)	7 (13)	3 (5)
Faculty of dentistry	7 (14)	25 (51)	17 (34.6)

Section III: Students' view of eHealth

One hundred students (98%) responded to the 16 questions of this section. The overall mean was 3.5 ± 0.9 on a 5-point Likert scale. The mean for the six positively phrased statements was 3.9 ± 0.8, whereas the corresponding figure for the negatively phrased statements was 3.28 ± 0.97 [Table 2].

Section IV: Students' use of information and communication technology devices

The students were asked about ICT devices they are using from a prepared list. As shown in Figure 1, around two out of three participants own a desktop or a tablet computer or a smartphone, and more than 85% of the participants own a laptop. Smaller percentage of the participants own an E-reader and a simple phone, and around a third of them own an MP3, an MP4, and/or console games.

When they were asked about the frequency of the use of common computer software, nearly 40% of the students never used spreadsheets (e.g., Excel), or any other data analysis software. Nearly 49% of the students never used databases and 32.4% of the students never used audio editing, video editing (23%), or other software related to image editing (18.6%). The most commonly used software was PowerPoint (94.1%) [Table 3].

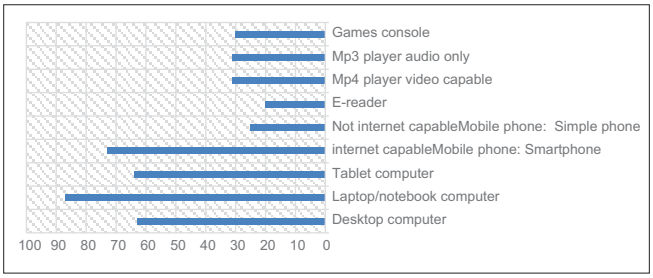

Figure 1: Use of information and communication technology devices by the medical students of Libyan International Medical University

Social media and other online activities are being used on a regular basis by most of the participants as shown in Table 4. Facebook (93.1%) and video (84.4%), document (81%), and photo (83.3%) sharing were most commonly used. LinkedIn scored the lowest (48.1%).

Table 5 shows the students' involvement in online entertainment, online information gathering, shopping, and communication. On an average, 74.8% ±7.4% of the students are using online entertainment. Respective values for information gathering and communication were 78.8 ± 5 and 81.3 ± 1.4. Online shopping scored the lowest (53.9%). Nearly 10%–14% of the students do not use E-mails or instant messaging.

Section V: Confidence in using information and communication technology software and devices for eHealth

The participants were asked about how confident they will be in learning how to use new ICT skills [Table 6]. The mean score on a 5-point Likert scale for all students was 3.1 ± 1.0. The mean percentage of not being sure of confidence in learning the skills was 25.8 ± 4.29, whereas the mean percentage of being confident or extremely confident was 51.1 ± 5.4. Table 6 shows that students' confidence in learning new ICT skills increased if they get different types of support.

Regarding the students' personal characteristics in learning a new computer technology or an online tool, the average for the five favorable personal characteristics was 3.7 ± 0.2, whereas the average for the five unfavorable characteristics was 2.7 ± 0.2, as measured on a 5-point Likert scale. There was a statistically significant difference between unfavorable and favorable characteristics in favor of positive ones (*t*-test: $P = 0.004$). Table 7 shows the percentages for each of these characteristics.

The students were also asked about the need for training on several software, as indicated in Figure 2. On an average,

Table 2: Students' view of eHealth

Statement	Mean±SD	Statement	Mean±SD
1. Engaging in eHealth would improve patient/client care	4.10±0.64	9. I think we are in danger of letting eHealth take over traditional health-care practices*	3.30±1.06
2. The information I get from electronic health records help me give better care to patients	4.00±0.74	10. eHealth helps to improve health care	3.76±0.98
3. Using ICT make my communication with other health professionals faster	4.08±0.8	11. Speed with access information using eHealth applications will help me give better care to patients	3.78±0.83
4. eHealth applications in health-care delivery may undermine patient confidentiality*	3.42±0.83	12. Time spent on eHealth is out of proportion to its benefits*	3.23±0.83
5. I believe that eHealth can help us deliver individualized care	3.79±0.95	13. Use of electronic health records would be more of a hindrance than a help to patient care*	3.23±0.98
6. Using ICT would make my communication with other health professionals less reliable*	3.20±1.05	14. I feel there are too many eHealth devices around now*	3.36±0.92
7. The cost of implementing eHealth would be better used to employ more staff*	3.42±1.02	15. Engaging in eHealth would make health-care staff less productive*	3.22±0.93
8. Time with patients decrease because of the time I spend working with eHealth tools*	3.43±1.10	16. Engaging in eHealth is more trouble than its worth*	3.07±0.99

*Negatively phrased statements. ICT: Information and communication technology, SD: Standard deviation

Table 3: Percentage in the frequency of the use of different computer software by medical students of LIMU

	Never*	Frequency not known	Monthly	1-2 times a week	3-4 times a week	5-6 times a week	Every day	Total (%)**
Word processing	7.8	14.7	23.5	10.8	9.8	9.8	18.6	87.2
Presentation, for example, PowerPoint	2	6.9	25.5	14.7	8.8	9.8	28.4	94.1
Spreadsheet, for example, Excel	42.2	9.8	10.8	8.8	7.8	7.8	2	47
Database	49	8.8	9.8	11.8	2	7.8	2.9	43.1
Data analysis	44.1	10.8	13.7	3.9	2	8.8	4.9	44.1
Video conferencing software	28.4	14.7	12.7	9.8	4.9	7.8	11.8	61.7
Audio editing software	32.4	10.8	20.6	4.9	11.8	6.9	4.9	59.9
Video editing software	23.5	15.7	23.5	4.9	8.8	10.8	5.9	69.6
Image editing software	18.6	9.8	25.5	4.9	13.7	5.9	15.7	75.5

*Did not count to total, **Including missing values. LIMU: Libyan International Medical University

Table 4: Frequency of the use of social media and online activity by medical students of LIMU

	Never*	Don't know the frequency	Monthly	1-2 times a week	3-4 times a week	5-6 times a week	Every day	Total (%)**
Facebook	5.9	1	7.8	6.9	7.8	1	68.6	93.1
LinkedIn	45.1	11.8	10.8	6.9	1	2.9	14.7	48.1
Twitter	33.3	1	11.8	9.8	3.9	5.9	29.4	61.8
Sharing content file: For example, Google Drive doc	11.8	4.9	15.7	11.8	9.8	3.9	35.3	81.4
Sharing video: For example, YouTube	12.7	3.9	16.7	11.8	4.9	10.8	36.3	84.4
Sharing photo: For example, Flickr, Instagram	13.7	4.9	18.6	9.8	15.7	11.8	22.5	83.3
Sharing presentation: For example, Slide Share	24.5	4.9	13.7	9.8	12.7	7.8	16.7	65.6
Collaboration, for example, Wikipedia	20.6	5.9	11.8	12.7	13.7	3.9	26.5	74.5
Virtual social worlds: For example, Second Life	39.2	6.9	13.7	9.8	6.9	4.9	12.7	54.9
Virtual games	38.2	4.9	13.7	13.7	4.9	4.9	14.7	56.8

*Didn't count to total, **Including missing values. LIMU: Libyan International Medical University

Table 5: The percentage of online activity of medical students of LIMU

	Never*	Don't know the frequency	Monthly	1-2 times a week	3-4 times a week	5-6 times a week	Every day	Total (%)**
Entertainment								
Stream movies	16.7	4.9	27.5	8.8	13.7	6.9	15.7	77.5
Stream music	11.8	2	14.7	14.7	7.8	9.8	33.3	82.3
Radio	27.5	3.9	19.6	6.9	9.8	5.9	18.6	64.7
Information gathering								
News	16.7	5.9	21.6	17.6	2	3.9	28.4	79.4
Weather	19.6	9.8	17.6	9.8	2	3.9	26.5	69.6
Health	9.8	4.9	12.7	8.8	15.7	8.8	33.3	84.2
Scientific journal articles	14.7	3.9	25.5	16.7	8.8	8.8	14.7	78.4
eBook	10.8	7.8	22.5	15.7	10.8	5.9	19.6	82.3
Shopping								
Online shopping	40.2	5.9	26.5	8.8	2.9	2.9	6.9	53.9
Communication								
Email	10.8	5.9	23.5	18.6	4.9	5.9	24.5	83.3
Instant messaging, for example, WhatsApp?	12.7	2.9	1	17.6	2	2.9	53.9	80.3
Video chat: For example, Skype, Viper, and Imo	14.7	3.9	14.7	11.8	7.8	3.9	38.2	80.3

*Didn't count to total, **Including missing values. LIMU: Libyan International Medical University

less than a third felt the need for training with a mean of 29.25% ± 14.4% (95% confidence interval = 26.46–32.05). More than half of the students felt a need to receive training in many software including creation of a spreadsheet, managing data with spreadsheet, and blogging [Figure 2].

Discussion

This article aims at determining how prepared are the students of two health professional schools at the LIMU for using ICT on graduation. The graduates of these two schools are expected

Table 6: Percentage frequency of confidence in learning new information and communication technologies skills

	Extremely unconfident	Unconfident	Not sure	Confident	Extremely confident
If there was no one around to tell you, what to do as you go	3.9	19.6	30.4	34.3	8.8
If you only had an instruction manual for reference	4.9	15.7	29.4	36.3	10.8
If you could call someone for help if you got stuck	3.9	12.7	30.4	38.2	10.8
If someone else had helped you get started	4.9	12.7	20.6	42.2	15.7
If you had a lot of time to learn how to do the task	6.9	13.7	21.6	34.3	17.6
If there was someone giving you step-by-step instructions	4.9	11.8	22.5	39.2	18.6
Mean±SD	4.9±1.0	14.3±2.6	25.8±4.2	37.4±2.8	13.7±3.7

SD: Standard deviation

Table 7: Percentages of personal characteristics in learning new computer technology

Statement	Extremely unlike me	Unlike me	Not sure	Like me	Extremely like me
Expect that I will experience many problems*	7.8	18.6	36.3	31.4	0
Doubt my ability to solve the problems that may arise*	6.9	15.7	37.3	26.5	3.9
Need to ask others for help	3.9	18.6	34.3	33.3	2.0
Try and persist on my own until it works correctly	2.0	11.8	32.4	30.4	11.8
Give up quickly if it doesn't work*	8.8	39.2	32.4	6.9	2.9
Put a lot of effort into getting it right	2.0	13.7	23.5	37.3	13.7
Immediately ask someone else if it doesn't work straight away*	6.9	19.6	36.3	20.6	4.9
Get someone else to do it for me or fix it*	12.7	24.5	36.3	12.7	2.9
Spend extra time trying to understand what to do	4.9	12.7	27.5	35.3	8.8
Get frustrated and annoyed at my lack of progress*	7.8	23.5	41.2	16.7	0

*Negative characteristics

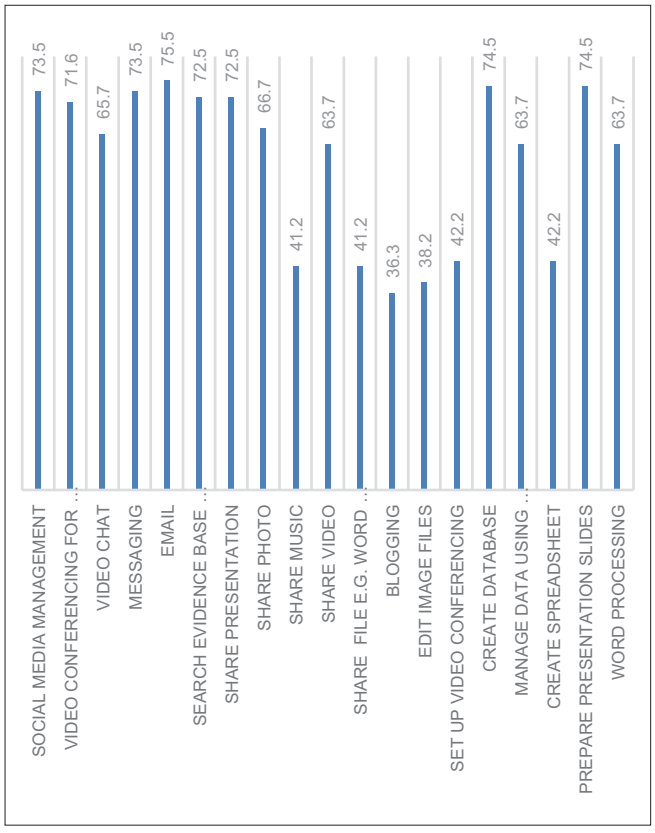

Figure 2: Need for training

to work in digitally laden environments where graduates face challenges to cope with the new work demands. It took about 3 months to get the responses from students. We had to stop receiving responses because it was clear that it is unlikely to get meaningful increase in responses. Slow and poor response rate is a common phenomenon in questionnaire-based researches.[15] We have noticed that persistence in seeking response contributed to increasing the response from participants, a finding noticed by others as well.[16] Females' responses predominated in the group, which is contradictory to other reports.[17,18] Surprisingly, 88% of the students did not take any IT-related courses. This figure is obviously high and probably results from the lack of a need to take such courses because the IT skills needed to study in medical and DSs are not so dependent on such skills. This calls for a real change in the IT skills used by students for searching and learning. The English mastery overall was good.

Forty-seven percent of the participants had no clear idea about what eHealth is. This is more than twice of what has been reported by Lam *et al*., where only one in five health professional students did not know exactly what eHealth is. This highlights the importance of tackling students' illiteracy of eHealth and calls for changes in the taught curricula.[14]

Although 47% of the students did not know exactly what eHealth is, their overall perception of it was good. The students showed more confidence in agreeing with positive

statements (mean score 3.9) but less so with negatively phrased statements (mean score 3.2). In spite of that, this result shows that work needs to be done to improve students' perception of eHealth.

A large percentage of students own digital devices and 85% own a laptop. This confirms that we are dealing with digitally oriented students. Other studies reported similar ownership rates.[19] Ownership of digital devices gives the students a direct access to scientific and educational resources and help connect them with educational forums. However, students owning such devices also use them for noneducational purposes even in classrooms.[20] They may even have a negative impact on learning in classroom. A probable solution for this is to construct instructional activities based on the use of such devices.

Nearly 27.5% of the students never used software among those included in the questionnaire. Strangely enough, 2% of the students never used Word Processing. However, the main gap was in using data management software such as Spreadsheets, database, and data analysis, where around 40% of the students reported not using them. This finding is probably explained by the lack of instructional activities using data management software. Involving students in research projects might foster learning such software.

An expected finding is the high frequency of the use of online activities. This high frequency of the use of online activities by students underlies the label given to the present-day students as digital natives. These students use laptops, tablets, smart phones, etc., in their daily life, so it was postulated that it would be easier for them to transfer these capabilities to their learning activities and later to the work environment.[21,22] This trend was observed among dental and medical students alike, simply because these are regular activities undertaken by all students irrespective of their field of education. Nowadays, students seek information from the Internet rather than regular books. Providing access to the Internet in classrooms may help increase student engagement in learning activities. Therefore, any recommendation coming out of this study should include reference to changes in classroom setup to allow for the use of digital equipment and software.

An important aspect of this article is the students' confidence in leaning new ICT skills. The self-determination theory focuses on three psychological needs which interact to foster motivation. These include need for competence, relatedness, and autonomy.[23] The perception of confidence helps satisfying the need for competence. For this reason, it could be speculated that confident students feel more competent and so have better mastery of their educational environment. The mean confidence in learning new ICT skills by the students included in this study was 3.1 ± 1.0, which shows almost a neutral trend but also shows that the range is wide. Even though around half of the students feel either confident or extremely confident, the other half feel either not sure or unconfident. This calls for implementing strategies that could help enhancing students' confidence in learning new ICT skills.

On testing the personal characteristics of students in learning new ICT skills, favorable characteristics predominated with a mean score of 3.7 ± 0.2. These include persistence, exerting more effort, spending more time, and seeking help from others. These favorable characteristics need to be strengthened in any learning program on ICT skills. Changing the mindsets of students could foster their adaptability and response to different challenges.[24]

An important dimension in learning is the student perception for the need of training. Students having this perception are more likely to be motivated in order to satisfy their need. The students in this study perceived this need only a third of the time. This issue is complicated because measuring perception may not truly reflect what is actually measured. Unfortunately, perception addresses only the first level in the Kirkpatrick training evaluation model. The need for training was highly expressed for data management software, and these are the same types of software on which many students do not have experience with, as shown in Table 3.

Conclusion

This article shows that the students at LIMU are digital natives. It also shows that there is a need for training on ICT skills for them to be readied for work in health-care services, especially on spreadsheets and data management software. In spite of their positive attitude toward eHealth, overall they lack an understanding of what eHealth is exactly about.

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Conflicts of interest

There are no conflicts of interest.

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ملخص المقال باللغة العربية

استعداد طلاب المهن الصحية لممارسة الصحة الإلكترونية

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خلفية: الصحة الإلكترونية هي واحدة من التطورات الرئيسية الأخيرة في توفير الرعاية الصحية. يُعتبر طلاب الصحة المحترفون اليوم مثقفين رقميًا، وقد يمنحهم ذلك القدرات اللازمة لتنفيذ الصحة الإلكترونية بعد التخرج.

الهدف: تهدف هذه الدراسة إلى تقييم وجهات نظر الطلاب واستخدامهم وثقتهم وحاجتهم إلى التدريب على الصحة الإلكترونية.

المشاركون: طلاب السنة الرابعة و الخامسة وطلاب الامتياز من كليات الطب البشري وطب الأسنان بالجامعة الليبية الطبية الدولية.

المنهجية: هذه دراسة مقطعية أجريت باستخدام دراسة استقصائية تم إدارتها عبر الإنترنت. قبل التنفيذ، تمت مراجعة الاستبيان بواسطة خبراء كما تم تجريبها عبر مجموعة من الطلاب المستهدفين بالبحث. تم استخدام مقياس ليكرت لمعظم الأسئلة وكان عدد قليل في شكل إجابات قصيرة. تم حساب الإحصاءات الوصفية باستخدام برنامج SPSS إصدار 20.0.

النتائج: أجاب مائة واثنان من الطلاب، وتم تضمين جميع المستجيبين في معظم أسئلة الرد المختارة. كانت نسبة الذكور إلى الإناث 2:3، بمتوسط عمر 24 ± 1.8 سنة. وشكل طلاب الطب البشري 52٪ من المشاركين. أبلغ ما معدله 45٪ من الطلاب عن إجادة اللغة الإنجليزية كتابة وتحدثا. 12٪ فقط درسوا دورات متعلقة بتكنولوجيا المعلومات. كانت وجهة نظر الطلاب حول الصحة الإلكترونية إيجابية إلى حد ما بمتوسط 3.5±0.34. على الرغم من ذلك، كان لدى 43٪±3.9 آراء سلبية على الصحة الإلكترونية. استخدم ما يقرب من 58٪ من المشاركين الأدوات والبرامج الرقمية برصيد متوسط قدره 2.43±0.6. أبلغ معظم الطلاب عن استخدامهم لوسائل التواصل الاجتماعي، وخاصة الفيسبوك (4.95±1.7). أبلغ الطلاب عن مستوى ثقة في استخدام تكنولوجيا المعلومات والاتصالات من 3.4 إلى 1.2. كما وصفوا ثقتهم في تعلم تقنية جديدة بقيمة (3±0.3). عبر حوالي 32.9٪ من المشاركين عن حاجتهم الإجمالية للتدريب على أدوات تكنولوجيا المعلومات والاتصالات.

الخلاصة: الاستعداد العام لهذه المجموعة لتكنولوجيا المعلومات والاتصالات معتدل ويحتاج إلى تحسين. ويمكن تحقيق ذلك من خلال إدخال تغييرات في المناهج التي يتم تدريسها.

الكلمات المفتاحية: الصحة، الصحة المهنية، تكنولوجيا المعلومات والاتصالات، ثقة التعلم.