Original Article

Incorporating "ICT" Training into Undergraduate Medical Curriculum: An Online Survey assessing the opinions of Medical Students

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ABSTRACT

Background: The huge relevance of Information and Communications Technology (ICT) in healthcare cannot be overemphasized. Despite the huge benefits associated with the use of ICT in healthcare, many medical schools (especially in the developing countries) are yet to incorporate ICT education as an academic course in their school curricula. This study aims to assess the opinions of medical students on the incorporation of ICT as an academic course into undergraduate medical curriculum.

Material and Methods: This study was a cross-sectional online survey of 135 Nigerians who were studying Human Medicine as at the time of the survey. Study data was collected using an e-questionnaire which explored the participants': level of academic exposure to ICT education, usage of digital health products, perception of the relevance of digital technologies in healthcare, and opinions on the incorporation of ICT into undergraduate medical curriculum. Collected data was analyzed using SPSS version 23 software.

Results: Majority of the respondents were from developing countries (95.6%), 71.1% were 21 – 25 years old, 63.7% were females, and 47.4% were final year students. Not up to one-third (28.1%) of them had ever taken a course (or obtained a degree) that is related to ICT, 5.9% did not consider digital health technologies to be of relevance to healthcare, 91.1% were of the opinion that the future of healthcare is digital, 87.4% were enthusiastic about using and/or promoting digital health strategies, 60.7% had used digital health product in their lifetime, and 94.8% were of the opinion that medical schools should have ICT courses in their curriculum. However, there exists no statistically significant difference between the opinions of the respondents on the incorporation of ICT into medical curriculum and their: gender, age, country of residence, location of school, and academic level (p-values>0.05).

Conclusion: Many of the surveyed medical students lack basic training on ICT despite their high rate of lifetime use of digital health products. Despite this, many of them are in favor of the incorporation of ICT as an academic course into the medical school curriculum.

Keywords: Information and Communications Technology, medical students, digital health, curriculum, education, opinions

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INTRODUCTION

The Information and Communications Technology (ICT) sector has seen tremendous growth in recent times with significant contributions to finance, media, education, and healthcare.[1] In fact, the World Health Organization identifies competence in ICT as one of the five core competencies required of the 21st century healthcare workforce.[2]

However, ICT advancement in the health sector has notably lagged behind other sectors, as reported in a recent study which surveyed over 600 digital transformation key decision makers from 6 industrial sectors.[3] This backward situation in the health sector could be attributed to reluctance to operational change among healthcare employees.[4] Likewise, in a study by Nakrem *et al*, which examined the experiences of health workers on the use of technology in their practice, it was found that healthcare professionals did not understand the rationale for digital technology or believe that it will improve the delivery of healthcare.[5] This same study also revealed that healthcare professionals had limited knowledge of digital systems.

Interestingly, despite the poor use of ICT in healthcare, there has been an increase in the number of 'digital hospitals', electronic medical records, new data capture and analysis technologies, as well as digitally enabled health consumers.[6] It is now becoming imperative for healthcare professionals and trainees to be well knowledgeable about digital health technologies and their use.[4,5,7]

Though published information on inclusion of ICT in the medical curriculum was not available to the researchers at the time of this study, several studies previously reported on poor ICT competence and computer utilization by medical students.[8] This is a deficiency that needs to be looked into due to the increasing demand for ICT in healthcare delivery.[4,5,7] Based on the above, this study explored the: level of academic exposure to ICT-related course, use of digital health products, perception of the relevance of digital technologies in healthcare, and opinions of Nigerians who were studying Human Medicine in Nigeria or overseas on the incorporation of ICT in undergraduate medical curriculum.

MATERIAL AND METHODS

This study was a cross-sectional online survey of Nigerians who were studying Human Medicine in Nigeria or overseas on issues pertaining to ICT training and its applications. The study tool was an anonymous and structured questionnaire which was developed from literatures on ICT and medical education.[7,10,11] Prior to its final use, the questionnaire was tested through a pilot study conducted among a group of healthcare practitioners and health science students. Adjustments were made to the piloted questionnaire based on the comments and suggestions raised by the participants in the pilot study. Thereafter, the questionnaire was thoroughly reviewed and edited by a research expert in medical education before its final use in this survey. The questionnaire obtained information about the participants': socio-demographic characteristics, history of participation in an ICT course, opinions on the relevance of digital technologies in healthcare, use of digital health product(s), enthusiasm about the use of digital health technologies, and opinions on the incorporation of ICT into the medical school curriculum.

The minimum sample size for this study (n=355) was calculated using the Leslie formula for study population <10,000 at a prevalence of formal computer training experience 36.1% derived from a previous study among nursing science students in a Nigerian public university.[12,13]

With the aim of recruiting a large number of medical students, an e-questionnaire (Google Form) was used for the study. Between October and December 2019, the hyperlink of the e-questionnaire was randomly circulated through online social chat rooms (e.g. WhatsApp, Telegram, etc.) of Nigerians who were studying Human Medicine, with focus on

Ghanaian, Nigerian, and Ukrainian medical schools. The hyperlink of the e-questionnaire was circulated to about 606 medical students. Prior to participation, the participants were informed about the aims and objectives of the study; they were also informed that their participation was strictly voluntary and harmless. Only those who identified themselves as Nigerians, who were willing to participate in the study and who also pressed the "I Agree" button on the "Consent Page" of the e-questionnaire were allowed to proceed to the subsequent sections of the questionnaire.

Collected data were analyzed using the SPSS version 23 software. The frequency distributions of all quantitative variables were determined. Bivariate analysis, using Chi square test, was done to test for associations between relevant variables. Results of data analysis were presented using sentences and tables.

Approval to conduct the study was obtained from the Department of Community Health, Aminu Musa Habib College of Health Science and Technology, Yauri, Nigeria. All participants gave informed consent to participate in the study, electronically. No medical student was coerced to participate in the study. Also, information concerning the personal identities of the participants was not obtained in order to keep their participation strictly confidential. Finally, no participant was harmed as a result of their participation in the study.

RESULTS

A total of 135 medical students participated in the study; hence the response rate for the study was 22.3% (135/606); hence, a total of 135 consenting medical students responded to the e-questionnaire: 95 (70.4%) of them were studying in Nigerian medical schools while the remaining 40 (29.6%) were studying in foreign medical schools. The majority (71.1%) of them were 21 – 25 years old, 63.7% were females, and 47.4% were final year students (Table 1).

Not up to one-third (28.1%) of the respondents had ever taken a course (or obtained a degree) that is ICT-related. Furthermore, the average credit units of the academic ICT course they took were 3.35 units. Interestingly, only 8 (5.9%) respondents did not consider digital health technologies to be of relevance to healthcare, 91.1% were of the opinion that the future of healthcare is digital, 87.4% were enthusiastic about using and/or promoting digital health strategies, and 94.8% were of the opinion that medical schools should have ICT courses in their curriculum (Table 2). Furthermore, Chi square test shows that there exists no statistically significant difference between the opinions of the respondents on the incorporation of ICT into medical curriculum and their: gender, age, location of school and academic level (p-vales>0.05) (Table 3).

Table 1. Socio-demographic characteristics of respondents

Characteristics	Frequency	%
Age in years		
<20	18	13.3
21 – 25	96	71.1
26 – 30	18	13.3
> 30	3	2.2
Gender		
Male	49	36.3
Female	86	63.7
Country of residence		
Developing	129	95.6
Developed	6	4.4
Location of school		
Nigeria	95	70.4
Outside Nigeria	40	29.6
Level		
Non-final year	71	52.6
Final year	64	47.4

Table 2. Experience and opinions of respondents on ICT

Variables	Frequency/value	%
Have you ever taken a course or obtained a degree that is ICT related?[a] (n=135)		
Yes	38	28.1
No	97	71.9
If yes[b], how many credit units was the course? (n=38)		
Mean	3.35	N/A
Median	3.00	N/A
Mode	3.00	N/A
SD	3.76	N/A
Digital technologies have little or no relevance in healthcare (n=135)		
Strongly disagree	93	68.9
Disagree	33	24.4
Indifferent	1	0.7
Agree	5	3.7
Strongly agree	3	2.2
The future of healthcare is digital (n=135)		
Strongly disagree	0	0.0
Disagree	3	2.2
Indifferent	9	6.7
Agree	68	50.4
Strongly agree	55	40.7
Have you ever used any digital health product? (n=135)		
Yes	82	60.7
No	53	39.3
I am enthusiastic about using and/or promoting digital healthcare strategies (n=135)		
Strongly disagree	1	0.7
Disagree	0	0.0
Indifferent	16	11.9
Agree	58	43.0
Strongly agree	60	44.4
Should medical schools have ICT courses in their curriculum? (n=135)		
Yes	128	94.8
No	7	5.2

"b" – Refers to those that ticked yes in the question tagged "a"; SD – Standard deviation; N/A – Not applicable; ICT – Information and Communications Technology

Table 3. Comparisons between socio-demographic characteristics of respondents and their experience and opinions on ICT

By gender	Male (n=49)	Female (n=86)	p-value
Have you ever taken a course or obtained a degree that is ICT related?			
Yes	15 (30.6)	23 (26.7)	0.631
No	34 (69.4)	63 (73.3)	
Digital technologies have little or no relevance in healthcare			
Strongly disagree	33 (67.3)	60 (69.8)	0.454
Disagree	13 (26.5)	20 (23.3)	
Indifferent	1 (2.0)	0 (0.0)	
Agree	2 (4.1)	3 (3.5)	
Strongly agree	0 (0.0)	3 (3.5)	
The future of healthcare is digital			
Disagree	1 (2.0)	2 (2.3)	0.618
Indifferent	2 (4.1)	7 (8.1)	
Agree	28 (57.1)	40 (46.5)	
Strongly agree	18 (36.7)	37 (43.0)	
Have you ever used any digital health product?			
Yes	33 (67.3)	49 (57.0)	0.235
No	16 (32.7)	37 (43.0)	
I am enthusiastic about using and/or promoting digital healthcare strategies			
Strongly disagree	1 (2.0)	0 (0.0)	0.457
Indifferent	5 (10.2)	11 (12.8)	
Agree	19 (38.8)	39 (45.3)	
Strongly agree	24 (49.0)	36 (41.9)	
Should medical schools have ICT courses in their curriculum?			
Yes	46 (93.9)	82 (95.3)	0.711
No	3 (6.1)	4 (4.7)	

By age	= 20 (n=114)	> 20 (n=21)	p-value
Have you ever taken a course or obtained a degree that is ICT related?			
Yes	30 (26.3)	8 (38.1)	0.270
No	84 (73.7)	13 (61.9)	
Digital technologies have little or no relevance in healthcare			
Strongly disagree	80 (70.2)	13 (61.9)	0.591
Disagree	26 (22.8)	7 (33.3)	
Indifferent	1 (0.9)	0 (0.0)	
Agree	5 (4.4)	0 (0.0)	
Strongly agree	2 (1.8)	1 (4.8)	
The future of healthcare is digital			
Disagree	2 (1.8)	1 (4.8)	0.710
Indifferent	7 (6.1)	2 (9.5)	
Agree	57 (50.0)	11 (52.4)	
Strongly agree	48 (42.1)	7 (33.3)	
Have you ever used any digital health product?			
Yes	69 (60.5)	13 (61.9)	0.905
No	45 (39.5)	8 (38.1)	
I am enthusiastic about using and/or promoting digital healthcare strategies			
Strongly disagree	1 (0.9)	0 (0.0)	0.261
Indifferent	5 (4.4)	1 (4.8)	
Agree	45 (39.5)	13 (61.9)	
Strongly agree	53 (46.5)	7 (33.3)	
Should medical schools have ICT courses in their curriculum?			
Yes	109 (95.6)	19 (90.5)	0.329
No	5 (4.4)	2 (9.5)	

By country of residence	Developing country (n=129)	Developed country (n=6)	p-value
Have you ever taken a course or obtained a degree that is ICT related?			
Yes	37 (28.7)	1(16.7)	0.522
No	92 (71.3)	5 (83.3)	
Digital technologies have little or no relevance in healthcare			
Strongly disagree	90 (69.8)	3 (50.0)	<0.0001
Disagree	32 (24.8)	1 (16.7)	
Indifferent	0 (0.0)	1 (16.7)	
Agree	5 (3.9)	0 (0.0)	
Strongly agree	2 (1.6)	1 (16.7)	
The future of healthcare is digital			
Disagree	3 (2.3)	0 (0.0)	0.761
Indifferent	8 (6.2)	1 (16.7)	
Agree	65 (50.4)	3 (50.0)	
Strongly agree	53 (41.1)	2 (33.3)	
Have you ever used any digital health product?			
Yes	77 (59.7)	5 (83.3)	0.246
No	52 (40.3)	1 (16.7)	
I am enthusiastic about using and/or promoting digital healthcare strategies			
Strongly disagree	1 (0.8)	0 (0.0)	0.301
Indifferent	14 (10.9)	2 (33.3)	
Agree	55 (42.6)	3 (50.0)	
Strongly agree	59 (45.7)	1 (16.7)	
Should medical schools have IT courses in their curriculum?			
Yes	122 (94.6)	6 (100.0)	0.558
No	7 (5.4)	0 (0.0)	

By location of school	Nigeria (n=95)	Outside Nigeria (n=40)	p-value
Have you ever taken a course or obtained a degree that is ICT related?			
Yes	21 (22.1)	17 (42.5)	0.016
No	74 (77.9)	23 (57.5)	
Digital technologies have little or no relevance in healthcare			
Strongly disagree	64 (67.4)	29 (72.5)	0.135
Disagree	25 (26.3)	8 (20.0)	
Indifferent	0 (0.0)	1 (2.5)	
Agree	5 (5.3)	0 (0.0)	
Strongly agree	1 (1.1)	2 (5.0)	
The future of healthcare is digital			
Disagree	2 (2.1)	1 (2.5)	0.886
Indifferent	7 (7.4)	2 (5.0)	
Agree	46 (48.4)	22 (55.0)	
Strongly agree	40 (42.1)	15 (37.5)	
Have you ever used any digital health product?			
Yes	53 (55.8)	29 (72.5)	0.069
No	42 (44.2)	11 (27.5)	
I am enthusiastic about using and/or promoting digital healthcare strategies			
Strongly disagree	1 (1.1)	0 (0.0)	0.238
Indifferent	8 (8.4)	8 (20.0)	
Agree	41 (43.2)	17 (42.5)	
Strongly agree	45 (47.4)	15 (37.5)	
Should medical schools have IT courses in their curriculum?			
Yes	90 (94.7)	38 (95.0)	0.950
No	5 (5.3)	2 (5.0)	

By level	Non-final year (n=71)	Final year (n=64)	p-value
Have you ever taken a course or obtained a degree that is ICT related?			
Yes	20 (28.2)	18 (28.1)	0.995
No	51 (71.8)	46 (71.9)	
Digital technologies have little or no relevance in healthcare			
Strongly disagree	52 (73.2)	41 (64.1)	0.600
Disagree	15 (21.1)	18 (28.1)	
Indifferent	1 (1.4)	0 (0.0)	
Agree	2 (2.8)	3 (4.7)	
Strongly agree	1 (1.4)	2 (3.1)	
The future of healthcare is digital			
Disagree	2 (2.8)	1 (1.6)	0.768
Indifferent	6 (8.5)	3 (4.7)	
Agree	34 (47.9)	34 (53.1)	
Strongly agree	29 (40.8)	26 (40.6)	
Have you ever used any digital health product?			
Yes	44 (62.0)	38 (59.4)	0.860
No	27 (38.0)	26 (40.6)	
I am enthusiastic about using and/or promoting digital healthcare strategies			
Strongly disagree	1 (1.4)	0 (0.0)	0.026
Indifferent	13 (18.3)	3 (4.7)	
Agree	24 (33.8)	34 (53.1)	
Strongly agree	33 (46.5)	27 (42.2)	
Should medical schools have ICT courses in their curriculum?			
Yes	67 (94.4)	61 (95.3)	0.804
No	4 (5.6)	3 (4.7)	

ICT – Information and Communications Technology

DISCUSSION

The need for the incorporation of ICT, as an academic course, into the medical school curriculum cannot be overemphasized.[7] With the rapid change in the trend of digital communications worldwide, the 21st century doctor must be well knowledgeable about the practical applications of ICT in healthcare. Generally, ICT is not an included course in many medical schools; therefore only little to no attention is paid to the training of medical students on the use of ICT.[7] However, this study was conducted with the main rationale of exploring the opinions of medical students on the incorporation of ICT into medical school curriculum.

The majority of the respondents in this study had never taken any course/obtained a degree that is ICT-related. This finding is similar with that reported among healthcare workers, and students in other relevant academic disciplines.[12,14,15] However,

further comparisons showed that the prevalence rate recorded in this study is far higher than that reported among nursing students in Malaysia (21.1%).[16] Also, the gender, age, and level of study of the respondents had no significant relationship with respondents' history of ever taking a course/having a degree that is related to ICT. On the other hand, respondents' school location is significantly associated with a history of taking an ICT-related course. Overall, this suggests that studying in a medical school outside Nigeria increases the chances of a medical student's participation in an ICT-related academic course.

Furthermore, despite the lack of academic knowledge of the respondents on ICT (as many of them had never taken an ICT-related course), yet many of them strongly considered digital technologies to be of relevance to healthcare. This finding is consistent with that reported among nursing students in Malaysia.[16] However, it is noteworthy that the use of digital health technologies is gaining popularity in the healthcare settings of developing countries as many of our respondents had a positive history of use of digital health products and as well were enthusiastic about the use and/or promotion of digital healthcare strategies. However, the proportion of the respondents residing in the developed countries surveyed who strongly considered that digital health technologies is relevant to healthcare was significantly higher than those from the developing countries; this significant difference may be due to the higher rate of exposure to the use of digital health products among the respondents in the developed countries.

Another major finding from this survey was that most of our respondents were of the opinion that ICT should be incorporated into medical school curriculum. Studies had earlier reported that there exists positive attitude towards ICT education among medical students and students from other healthcare disciplines.[17] However, factors such as gender, age, country of residence, location of school, and level of study of the respondents had no significant relationship with our respondents' opinions about the incorporation of ICT as a course into medical school curriculum. This shows that most of the participants, irrespective of their socio-demographic background, were interested in acquiring academic knowledge on ICT while in medical school.

Importantly, this study has its limitations. First, the response rate of medical students to the e-questionnaire was very low. Probably, this may be due to their low level of proficiency in ICT application. Second, the sample of the study is small, of which the majority of them were Nigerians; hence, it will be difficult to make some over-generalizations on medical students regarding ICT based on the study data. Third, the hyperlink of the study questionnaire was circulated on online social chatrooms in which the authors had access to; hence, only those medical students on the chatrooms where the hyperlink for the e-questionnaire was circulated had the opportunity to participate in the study. Therefore, this did not give all medical students in Nigeria the equal opportunity to participate in the study.

Notwithstanding the above-stated limitations, this study is believed to be the first Nigerian survey, to the best of the authors' knowledge, which explored the opinion of medical students on the incorporation of ICT academic course into the medical school curriculum.

However, based on the findings made in this study, we make the following recommendations: (1) the Nigerian government, at all levels (federal, state, and local governmental levels) should formulate and implement sustainable educational policies that will favor the application of ICT in the training of medical doctors; (2) medical educators and ICT educators in Nigeria and overseas should advocate for the review and incorporation of ICT-related courses into the academic curriculum of medical education; (3) all medical schools should quickly incorporate ICT-related courses into their academic

curriculum. Through the implementation of these recommendations, future medical students in Nigeria will be more proficient in ICT skills unlike the present and the past generation of doctors.[15]

In conclusion, this study showed that the surveyed medical students overwhelmingly favored the incorporation of ICT as an academic course in undergraduate medical curriculum. If implemented, especially in the developing countries, it will be significant in fulfilling the World Health Organization aspiration of having a digitally savvy 21st century healthcare workforce. Following this, we recommend that relevant stakeholders, including ministries of health, develop policies to integrate ICT courses in medical school curriculum.

CONFLICT OF INTEREST

Authors have none to declare.

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