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Educating Optometry Undergraduates Through Telemedicine: The Optometry Educator's Perspectives

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Abstract

Introduction: Although telemedicine has been long available, the pandemic precipitates immediate demand to expand ophthalmic care delivery. For the technology to be used in local practices, a few factors need to be considered in terms of awareness, knowledge, attitude and individual skills regarding telemedicine from the optometry educator's perspective. Methods: A cross-sectional study was done among the optometry educators servicing the optometry school in Malaysia. A validated questionnaire regarding the awareness, knowledge, attitude and individual skills of telemedicine was adopted from the previous study. The responses were gathered from two- to five-point scales which differed from each section. The level of awareness, knowledge, attitude and skills were calculated by the summation of the answer collected. Scores less than 49% were considered low, 50% to 70% were considered average and 71% and above were considered high. Results: 48 out of 70 respondents (68%) returned the survey after three weeks of distribution from five main universities in Malaysia. Fifty-eight percent of the respondents are highly aware of telemedicine, the minority (27%) showed a high knowledge of telemedicine, a majority (83%) have a high attitude towards telemedicine, and almost halves of respondent (44%) have average to high skills in ICT. There is a significant difference in total scores of knowledges, attitudes, and skills among educators that have different roles in the department, academic qualifications and working experience ($p<0.05$). An open-ended questionnaire showed that majority of the respondents have low acceptability of the implementation of telemedicine in the practice due to lack of training and the unavailability of the facilities that provide it. Conclusion: Awareness, knowledge, attitude, and skills towards telemedicine were on an average to high level among the optometry educators, however, the lack of training and lack of availability results in poor acceptability of it.

Keywords: Telemedicine, Optometry Educator, Awareness, Knowledge, Attitude, Skills

Introduction

Telemedicine has increased in reliance since the outbreak of COVID-19 as it supports distance healthcare delivery, expands access and improves health outcomes. It utilizes advanced information and communication technologies in diagnosing, treating and

preventing disease, research and evaluation and for the continuing education of health care providers (World Health Organization., 2010) To fully benefit from the advancements in digital health technologies, healthcare practitioners will need to become digitally competent in the future (Nguyen et al., 2022). Healthcare practitioners both in industry and academic institutions are urged to provide appropriate knowledge and skills to suit the growing demand.

A study on knowledge and perception about telemedicine among the health professional in Malaysia showed poor experience with telehealth applications and knowledge, but a majority of the respondents accepted the use of the internet and computer in their line of work (Izham et al., 2010) Meanwhile, a recent study found telemedicine was useful in situations similar to COVID-19 among healthcare professional, yet only 22% reported using telemedicine for consultation during COVID-19 pandemic (Thong et al., 2021). Though limited studies were done regarding the perception of telemedicine in Malaysia, among the barriers was difficulties in adapting to the IT equipment and infrastructure may contribute to the poor acceptance of telemedicine. However, the study of telemedicine in Malaysia more focuses on medical doctors as healthcare professionals; little is known about the perception of telemedicine among other allied health professionals.

In eye care services, telemedicine has been used for screening and diagnosing ocular disease (Sommer & Blumenthal, 2020; Valentim et al., 2022), low vision rehabilitation (Christy et al., 2022), consultation (Mansoor et al., 2021), and triaging patients for appointment referral (Phu et al., 2021). Although telemedicine has been long available, the pandemic precipitates immediate demand to extend ophthalmic care delivery. From an optometric educational perspective, the undergraduates are required to be prepared with the enhanced technology to be able to adapt to the complex situation in the future (Nguyen et al., 2022)

Availability and training are important to implement telemedicine in eye care practices by optometric educators. The level of knowledge and acceptance depends on how familiar the person is with the technologies that are used in telemedicine. Educators specifically should have basic knowledge on how to apply it in their clinical practices, but that depends on the training and facilities that are available in their universities. Hence, there is a need to assess the awareness, levels of knowledge, perception, and attitude of the optometry educators in the universities prior to the implementation of telemedicine in optometry undergraduate studies. With this information, further investigation can be done and the level of implementation of telemedicine in optometry practices can be observed.

Methodology

This study is approved by the university's research ethics committee with approval number REC/05/2021 (UG/MR/438) dated 11th May 2021. A cross-sectional study was done among optometry educators servicing the optometry schools in Malaysia. A self-administered questionnaire was distributed directly through the e-mail of optometry educators from the universities that offer undergraduate and postgraduate optometry courses. Due to the small sample population with the finite amount, Yamane formula was used to calculate the sample size. The total population including the part time supervisors, full time lecturers, and optometrists were 86 which the total number of respondents calculated by the formula was approximately 70 respondents.

$n = N / (1 + N(e)^2)$

N = total population, e = margin of error, (0.05)

The universities involve were; SEGi University, UCSI University, Management & Science University (MSU), Universiti Kebangsaan Malaysia (UKM), Universiti Islam Antarabangsa Malaysia (UIAM), and Universiti Teknologi Mara (UiTM) Puncak Alam, Selangor. The respondents involved were full-time or part-time lecturers or optometrists at the universities involved. No optometry students and supporting staff were involved in the study. The e-mails were obtained based on the available e-mail database of each university and from peers of the selected universities. All of the data were collected from google form after three weeks of distribution.

A validated structured questionnaire from a previous study that investigated the awareness, knowledge, attitude, and skills of telemedicine among health professional faculty working in teaching hospitals was adopted (Zayapragassarazan & Kumar, 2016). The questionnaire consists of 62 questions and is divided into six sections which comprise of Section I: Demographic data, Section II: General statement on telemedicine, Section III: Knowledge on telemedicine, Section IV: Attitude on telemedicine, Section V: Technological skills and lastly, Section IV: opinions on telemedicine.

In Section I, the subjects were asked about their personal information such as their age, gender, academic qualifications, their role in the department, teaching experiences, and computer knowledge. Section II consists of 11 questions related to the awareness of telemedicine. The original questionnaire consisted of 12 questions but one was omitted in this study due it to being unrelated to the current respondents working status. This section's responses were on a three-point scale ranging from 0-2 which were: '0' indicates 'don't know', '1' indicates 'heard of it', and '2' indicates 'know about it. The score for this section was a minimum of '0' and a maximum of '22'. Section III focuses on the knowledge of the subjects that consists of 11 questions. The section responses were on a 'yes' or 'no' basis which '0' indicates 'no' and '1' indicates 'yes'. The minimum score for this section was '0' and a maximum of '11'. Section IV consisted of 11 statements to determine the attitude of the subjects towards telemedicine. This section responses were a graded response to each statement on a five-point Likert scale ranging from 0-4 which; '0' for 'strongly disagree, '1' for 'disagree', '2' for 'neutral', '3' for 'agree', and '4' for 'strongly agree'. This section's minimum score was '0' and the maximum score was '44'. Section V consists of statements regarding the evaluation of the respondent's level of ICT skills. The responses were on a graded four-point scale ranging from 0-3 which; '0' was for 'unskilled', '1' for 'learner', '2' for 'mediocre', and '3' was for 'expert'. One can score a minimum of '0' and a maximum of '39'. Section VI was on open-ended questions for the respondents to give their comments and from that, the acceptability of telemedicine was assessed.

The Statistical Software Statistical Package for the Social Sciences (SPSS) version 25 was used for analysis. The answers from the respondents were analyzed by using descriptive statistics for the quantitative data and content analysis for the qualitative data. All numerical data are presented in mean and standard deviation and categorical data are presented in frequency and percentages. Chronbach alpha was used to find the reliability of the data which the value of alpha closer to 1.00 indicated a reliable data collection, and Shapiro Wilk test of normality ($p>0.05$), skewness, and normal Q-Q plot indicated normal data distribution. Independent T-test was used to investigate the difference of demographic factors to the level of knowledge, attitude, and acceptability of optometry educators towards the implementation of telemedicine; by which the p-value less than 0.05 indicates the significance. The level of awareness, knowledge, attitude and skills were calculated by the

summation of the answer collected. Scores less than 49% were considered as 'low', 50% to 70% were considered as 'average' and 71% and above were considered as 'high'.

Results

Demographic Analysis

A total of 48 out of 70 respondents (68%) returned the questionnaire along with an informed consent form. The answers were collected from the universities that offer undergraduate optometry courses in Malaysia. The distribution of the sample from the universities were 14 (27.1%) from UIAM, 14 (29.2%) from UiTM, 9 (18.8%) from both UKM and MSU, and lastly, 3 (6.3%) from UCSI.

The reliability tests were determined by using the Cronbach Alpha, which showed all items from the awareness, knowledge, attitude, and skills (AKAS) were 0.878, 0.747, 0.867, and 0.888 respectively. The distribution consists of 69% female respondents and 31% male respondents. Postgraduates from masters and Ph.D. respondents formed a majority of 73%. 71% of the respondents have working experience of more than 15 years while 29% of them have working experience of fewer than 15 years, with total mean years of working experience was 12.98 ±6.55 years. The respondent's mean age was 38.48 ±6.32 years, showing 29 (60%) of them were younger than 40 years old. Table 1 describes the demographic distribution of this study.

Table 1
Demographic distribution among optometry educators in Malaysia

Variables Sample (n=48)	**Frequency (n)**	**Percentage (%)**
Gender		
Male	15	31.3
Female	33	68.8
Academic Qualification		
Undergraduate	13	27.0
Postgraduate	35	73.0
Role in Department		
Lecturer	23	47.9
Optometrist	25	52.1
Teaching Experience		
Experience < 15 years	34	70.8
Experience > 15 years	14	29.2
Age		
Age < 40 years	29	60.4
Age > 40 years	19	39.6

Level and Degree of Awareness, Knowledge, Attitude, and Skills

Table 2, 3, 4, and 5 shows the responses of each item in the questionnaire by each section. On the awareness of the respondents, a majority (81%) of the respondents were aware on telemedicine provides services where distance is the problem which is the definition of telemedicine (A6). The knowledge section showed that all the respondents (100%) knew that telemedicine is the use of telecommunication to provide medical information and service (K1), also medical records of doctors and patients' consultations can be done electronically

(K10). On the attitude of the respondents, a majority (58%) of the respondents strongly agreed that access to medical information through emails and websites was encouraged to the patient (AT7) and easier public access to telemedicine services (AT8). The skills among the respondents to ICT showed that majority of the respondents (56%) were deemed to be experts in using emails with file attachments (S1) and scanning documents and pictures (S2). And a majority of the respondents (67%) were mediocre in participating in e-discussion forums (S6).

Table 2
Responses on awareness of telemedicine

Awareness	**Frequency (%)**		
	Don't know	**Heard of it**	**Know about it**
A1- Information and communication technology (ict) can be effectively used in health services	*2 (4.2%)*	*12 (25%)*	*34 (70.8%)*
A2- Information technology (it) and ict enabled services are the latest advancements in medical field.	*3 (6.3%)*	*13 (27.1)*	*32 (66.7%)*
A3- Telemedicine is part of medical education technology	*4 (8.3%)*	*15 (31.3%)*	*29 (60.4%)*
A4- Telemedicine and e-health are synonymous terms	*15 (31.3%)*	*19 (39.6%)*	*14 (29.2%)*
A5- Face to face interaction of patient and doctors is possible through telemedicine	*6 (12.5%)*	*14 (29.2%)*	*28 (58.3%)*
A6- Telemedicine provides health care services where distance is a problem.	*1 (2.1%)*	*8 (16.7%)*	*39 (81.3%)*
A7- Images can be transmitted to a remote specialist for consultation	*6 (12.5%)*	*11 (22.9%)*	*31 (64.6%)*
A8- Electronic home visits are possible for elderly patients through telemedicine	*11 (22.9%)*	*16 (33.3%)*	*21 (43.8%)*
A9- CME programmes can be done effectively and in a cost effective way through telemedicine.	*5 (10.4%)*	*9 (18.8%)*	*34 (70.8%)*
A10- Telemedicine can be used in battlefield casualties, prisons, for disabled patients and during natural and man-made calamities distance.	*16 (33.3%)*	*16 (33.3%)*	*16 (33.3%)*
A11- Telemedicine helps in making medical education to a wider group of teachers and students.	*4 (8.3%)*	*12 (25%)*	*32 (66.7%)*

Table 3
Responses on knowledge of telemedicine

Knowledge	**Frequency (%)**	
	Yes	**No**
K1- Telemedicine is the use of telecommunication to provide medical information and services.	48 (100%)	-
K2- Patients management with drugs can be done through telemedicine	27 (56.3%)	21 (42.8%)
K3- Direct full consultation of patients is possible through telemedicine	33 (68.8%)	15 (31.3%)
K4- Through Telemedicine Consultation of patients through another professional via the internet is common	36 (75%)	12 (25%)
K5- Patients' examination can be communicated through telemedicine	21 (43.8%)	27 (56.3%)
K6- Patients' investigations can be communicated through the telemedicine	35 (72.9%)	13 (27.1%)
K7- Follow-up of patients can be done through telemedicine	41 (85.4%)	7 (14.6%)
K8- Management of patients including surgical procedure through the telemedicine	5 (10.4%)	43 (89.6%)
K9- Electronic medical record of patients' registration can be maintained through telemedicine	47 (97.9%)	1 (2.1%)
K10- Electronic medical record of patients consultation with doctor	48 (100%)	-
K11- Health care through the internet is a recognized service	34 (70.8%)	14 (29.2%)

Table 4
Responses on attitude to telemedicine

Attitude	**Frequency (%)**				
	Strongly disagree	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
AT1- Knowing more about computers and applications of ICT in medical field is a must for health professionals	0	1 (2.1%)	1 (2.1%)	21 (43.8%)	25 (52.1%)
AT2- Telemedicine encourages team working among health professionals which leads to quality health care	0	0	3 (6.3%)	22 (45.8%)	23 (47.9%)
AT3- Application of ICT in health care services reduces the financial burden to government	0	3 (6.3%)	7 (14.6%)	27 (56.3%)	11 (22.9%)
AT4- Health for all can be easily achieved through ICT enabled health services	0	2 (4.2%)	8 (16.7%)	22 (45.8%)	16 (33.3%)
AT5- Health professionals can personally benefit from being more aware of what Telemedicine can offer	0	0	3 (6.3%)	27 (56.3%)	18 (37.5%)
AT6- I would attend training courses in Telemedicine if they were offered at my hospital	0	1 (2.1%)	6 (12.5%)	16 (33.3%)	25 (52.1%)
AT7- Patients should be encouraged to have access to medical information through e-mails and websites so that they become better informed of their medical condition	0	2 (4.2%)	2 (4.2%)	16 (33.3%)	28 (58.3%)
AT8- Telemedicine combined with easy public access to health information and advice will make for a healthier population in the future	0	1 (2.1%)	1 (2.1%)	18 (37.5%)	28 (58.3%)
AT9- Use of Telemedicine will blur the distinction between primary and secondary healthcare by improving the links between patients, nurses, GPs and consultants	1 (2.1%)	4 (8.3%)	9 (18.8%)	20 (41.7%)	14 (29.2%)
AT10- use of Telemedicine could encourage more team working in healthcare	0	1 (2.1%)	7 (14.6%)	19 (39.6%)	21 (43.8%)
AT11- use of Telemedicine could make the distribution of healthcare more even with more emphasis on prevention	0	0	6 (12.5%)	22 (45.8%)	20 (41.7%)

Table 5
Responses to skills in ICT

Skills	**Frequency (%)**			
	Unskilled	**Learner**	**Mediocre**	**Expert**
S1- Use E-mails with file attachments	1 (2.1%)	3 (6.3%)	17 (35.4%)	27 (56.3%)
S2- Scan documents and pictures	1 (2.1%)	4 (8.3%)	16 (33.3%)	27 (56.3%)
S3- Videoconferencing	0	6 (12.5%)	31 (64.6%)	11 (22.9%)
S4- Digital photography	7 (14.6%)	18 (37.5%)	15 (31.3%)	8 (16.7%)
S5- Gain access and search a medical site such as 'Medline', etc	0	3 (6.3%)	30 (62.5%)	15 (31.3%)
S6- Participate in e-discussion forums	0	5 (10.4%)	32 (66.7%)	11 (22.9%)
S7- Download and upload WebPages and images	1 (2.1%)	6 (12.5%)	26 (54.2%)	15 (31.3%)
S8- Install and uninstall software	1 (2.1%)	14 (29.2%)	17 (35.4%)	16 (33.3%)
S9- Use relevant software for reading medical images	6 (12.5%)	17 (35.4%)	18 (37.5%)	7 (14.6%)
S10- Set up a web camera	2 (4.2%)	11 (22.9)	25 (52.1%)	10 (20.8%)
S11- Online chatting	1 (2.1%)	1 (2.1%)	29 (60.4%)	18 (37.5%)
S12- Burn disc or copy files to external storage devices	3 (6.3%)	7 (14.6%)	14 (29.2%)	24 (50%)
S13- Establish connectivity	0	9 (18.8%)	30 (62.5%)	9 (18.8%)

Comparison of Awareness, Knowledge, Attitude, and Skills Between Each Subcategory

The data shows that there is a significant difference in knowledge (p = 0.007, 95%CI -3.17, -0.54), attitude (p=0.025, 95%CI -7.25, -0.49) and skills (p = 0.009, 95%CI -9.07, -1.38) between postgraduate holders and bachelor holders among optometry educators. Master/PhD holders showed a higher mean score than bachelor holders for knowledge (Mean= 8.31±2.01 and Mean=6.46±2.02), attitude (Mean= 37.02±4.99 and Mean=33.15±5.63), and skills (Mean= 28.46±5.24 and Mean=23.23±7.40). The role in the department between lecturer and resident optometrist for knowledge and skills showed a significant difference with a p-value of 0.007 (95%CI 0.49, 2.89) and 0.004 (95% CI 1.67, 8.58) respectively. The lecturer showed a higher mean score on knowledge (Mean=8.48±1.78) and skills (Mean=29.07±5.13) as compared to the resident optometrist (knowledge mean=6.79±2.23, skills mean=23.95±6.72). Working experience less than 15 years showed a significantly high skill (Mean=28.18±5.83, p=0.050, 95%CI 0.03, 7.78) as compared with working for more than 15 years (Mean=24.29±6.68). There is no significant difference in the

level of awareness, knowledge, attitude, and skills across different age groups and gender (p>0.005).

Table 6
Comparison between subgroup of respondents on Awareness, Knowledge, Attitude, and Skills

Sample	Awareness			Knowledge			Attitude			Skills		
	Mean	SD	P-value	Mean	SD	P-value	Mean	SD	P-value	Mean	SD	P-value
Overall (N=48)	15.94	5.00		7.81	2.16		35.98	5.40		27.04	0.90	
Male (N=15)	16.40	5.55	0.674	8.33	2.19	0.265	36.27	6.30	0.807	27.00	7.29	0.976
Female (N=33)	15.73	4.88		7.58	2.14		35.85	5.03		27.06	5.89	
Undergraduate (N=13)	14.46	6.65	0.221	6.46	2.02	**0.007**	33.15	5.63	**0.025**	23.23	7.40	**0.009**
Postgraduate (N=35)	16.48	4.30		8.31	2.01		37.02	4.99		28.46	5.24	
Lecturer (N=29)	16.82	4.31	0.118	8.48	1.78	**0.007**	36.45	4.91	0.463	29.07	5.13	**0.004**
Optometrist (N=19)	14.52	5.85		6.79	2.23		35.26	6.17		23.95	6.72	
Experience < 15 years (N=34)	15.76	4.87	0.716	7.53	2.19	0.159	36.47	5.58	0.331	28.18	5.83	**0.050**
Experience > 15 years (N=14)	16.36	5.62		8.50	1.99		34.79	4.92		24.29	6.68	
Age < 40 years (N=29)	15.45	5.37	0.413	7.55	2.35	0.307	36.17	5.70	0.763	28.14	6.41	0.137
Age > 40 years (N=19)	16.68	4.56		8.21	1.81		35.68	5.03		25.37	5.82	

*p value < 0.05 indicate statistical significant

Subjective Opinions on Telemedicine

Table 7 shows a summary of the collected comments and the suggestion. The majority of the respondent's problems in using telemedicine were limited interaction with the patient (25%) and other factors (25%) such as availability, relevancy, awareness, and not a user. The reason for the respondent's currently not using telemedicine was mainly because of a lack of accessibilities and facilities (33%). The second reason was the suitability of using it in the field of work (27%). Suggestions were given by the respondents and the majority of them suggested providing more facilities and training (27%) for telemedicine to be used. They also suggested the promotion of spreading awareness of telemedicine.

Table 7
Summary of comments and suggestions on the common issues of telemedicine

	Issues and suggestions	**Frequency (%)**
Problem faced	Lack of knowledge	4 (8.3%)
	Poor internet coverage	9 (18.8%)
	Limited interaction with the patients	12 (25%)
	Lack of training	3 (6.3%)
	Others • Availability • Irrelevant • Not a user • Public awareness	12 (25%)
Reason for not using	No access / no equipment	16 (33.3%)
	Less training and demand	6 (12.5%)
	Unsuitable in the field	13 (27.1%)
	Others • Internet connection • Lack of awareness & exposure • Limited communication	10 (20.8%)
Suggestions	Provide facilities and training	13 (27.1%)
	Promote more telemedicine	12 (25%)
	Others • Improve internet services • Integration with the government	5 (10.4%)

Degree of awareness, knowledge, attitude, and skills among the respondents

Table 8 recorded the detailed description of frequency for low, moderate, and high levels of awareness, knowledge, attitude, and skills regarding telemedicine among optometry educators in the study. Overall, 58% have high awareness, 47.9% have moderate knowledge, 83% have a positive attitude, and 44% have high skills.

Table 8
Overall degree of awareness, knowledge, attitude, and skills among the respondents

Degree		Frequency	Percentage
Awareness	**Low**	7	14.6
	Average	13	27.1
	High	28	58.3
Knowledge	**Low**	12	25
	Average	23	47.9
	High	13	27.1
Attitude	**Low**	1	2.1
	Average	7	14.6
	High	40	83.3
Skills	**Low**	6	12.5
	Average	21	43.8
	High	21	43.8

Discussion

Moderate to high level of awareness, knowledge, attitude, and skills (AKAS) regarding telemedicine among optometry educators in Malaysia's universities were reported in this study. This is contrary to the previous study on the perception of telemedicine among healthcare practitioners in a teaching hospital in the Puducherry Region of India; the study showed inadequate levels of AKAS (Zayapragassarazan & Kumar, 2016). In a recent study in Malaysia, only a handful of doctors (34.2%) agreed telemedicine was useful in situations similar to the pandemic of COVID-19 and the majority (74%) felt that telemedicine would only benefit up to 30% of their patients (Thong et al., 2021). However, the physician and female gender have a more positive outlook compared to the surgeon in four urban healthcare facilities in Malaysia (Thong et al., 2021). In eye care services, the attitude of eye care providers toward teleophthalmology was different before the pandemic which the majority of them have low confidence in remote care for providing an opinion on patient care (Woodward et al., 2015). However, in other studies on changes in ophthalmic clinicians' attitudes toward telemedicine, the majority of them were somewhat confident about using telemedicine during the pandemic (De Lott et al., 2021). Similarly in India, a proportion of optometrist have switched to some form of teleconsultation in order to aid patients during this prevailing pandemic (Karthikeyan et al., 2022). The COVID-19 pandemic has driven increased telemedicine utilization in most fields of medicine and the development of technologies throughout the years which explained the inadequate level of awareness, knowledge, attitude, and skills regarding telemedicine before the pandemic. However, there were limitation such of diverse types of questionnaires, locations and professional areas in previous studies cause a non-parallel comparison for the subject matter.

This study also shows a significantly higher positive attitude and skills of telemedicine among lectures as compared to resident optometrists teaching in optometry schools in Malaysia. This is aligned with a study done on optometry educators in India that showed an increase in the use of e-learning alternatives during pandemic (Sehgal et al., 2021). Majority (94%) of them had switched to e-learning mode, with most teaching-and-learning and assessments conducted using video conferencing tools, dedicated educational portals, and social media applications (Sehgal et al., 2021). A study done on an approach to teaching

undergraduate surgery students during the Covid-19 pandemic proposed that educators and lecturers need to reschedule and revise the teaching activities with new strategies and platforms that are available online to compensate for the gap in learning in times of crisis show the need for lecturers to be adequately skilled in using virtual technologies nowadays (Agarwal, 2020). Postgraduate educators also obtained higher scores for knowledge, attitude and skills as compared to undergraduates educators in current study ($p<0.005$), might showed their maturation and wide exposure of the optometric field throughout their academia journey. Meanwhile, the optometry educators with younger experience (less than 15 years) with significantly high skills are concurrent with the previous study on knowledge, attitudes and perceptions among young doctors and nursing staff (Ahmed et al., 2021). This generation are in a good knowledge of technology and well versed with computers and smartphones and has clear ideas regarding their utility in patient dedicated care and follow-up.

The comments and suggestions recorded from the respondents in the study emphasize the need for promotion or spread of awareness of telemedicine to the public and the need in providing more facilities and training to healthcare practitioners and departments which later may help in the future application or utilization of telemedicine. Also, the majority of the respondent's reasons for not using telemedicine were because of the unavailability of facilities that providing it. Financial factors can be the reason behind it but there are not stated in the data collected. All of the suggestions proposed are concurrent with the previous study on AKAS of telemedicine among health professional faculty on the training needs of telemedicine staff (Zayapragassarazan & Kumar, 2016). An appropriate module will help the practitioners in acquiring knowledge and skills of health information technology like was suggested in the majority of the respondents in this study. There is also a suggestion by the respondents on the involvement with the government bodies in the application of telemedicine in healthcare practice. This is parallel with previous research on perception of telemedicine among medical practitioners in Malaysia; they were concern on medico-legal, security and privacy implications of telemedicine, adequate training of healthcare professionals, reimbursement for telemedicine services and lacked of adequate infrastructure for telemedicine (Thong et al., 2021).

There are several limitations in this study. This study was done among the optometry educators includes lecturers and optometrists in universities in Malaysia. This causes a small sample size with less than 100 respondents that may affect the results calculated. Additionally, the results obtained cannot be concluded to all healthcare practitioners in Malaysia. This study also does not take into consideration the availability of telemedicine units in the respondent's teaching universities in Malaysia. Moreover, varieties of questionnaire used in previous study causes in non-standard comparison to current findings. Future studies can be done by including all optometrists whether in educational environments, private practices, or in hospitals. Also, the study can be improved further by comparing the awareness, knowledge, attitude, and skills with regard to the availability of telemedicine application in their practice.

Conclusion

The awareness, knowledge, attitude, and skills of optometry educators in Malaysia may be on a moderate to a high level, however, the lack of availability, application, services, and training causes poor acceptability of telemedicine to be adapted in the practices. Therefore, it is important for more research and development of telemedicine to be done in Malaysia and providing more applicable facilities, services, and training or workshop for healthcare

practitioners or specifically in this study the optometry educators for telemedicine to be used in the future.

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