

Full Length Research Article

## Knowledge and Perception of Veterinary Students in Ghana on Telemedicine

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**Summary:** This study aimed at assessing the knowledge base and perception of telemedicine among veterinary students in Ghana. It involved a cross sectional survey and online structured questionnaires were administered to 114 veterinary students to access their knowledge of telemedicine and the perceived utilisation, benefits, complexity and disadvantages of telemedicine. Descriptive statistics analysis was performed on the data collected using SPSS version 20 and Pearson Chi-square test was used to determine the significant association between categorical variables which were grouped. Statistical significance was tested at 5% significance level. The students exhibited good knowledge and perception of telemedicine with a mean response of  $4.947 \pm 1.374$  and  $3.473 \pm 1.115$ ; represented by 86.8% and 78.9% of the students respectively. 92.1% had heard of the term 'telemedicine' from the internet and social media platforms. The level of study of veterinary students had a significant effect ( $p < 0.05$ ) on their knowledge of telemedicine; knowledge increases with an increase in the year of study. Veterinary students showed good knowledge level and perception of telemedicine. However, exposure to the use of telemedicine system is low. Issues of patients' information privacy being threatened by the usage of telemedicine were indicated. Development, incorporation of telemedicine in the curriculum in formative years of veterinary students training is critical to ensure effective and efficient training of students in telemedicine in the COVID era.

**Keywords:** Telemedicine, Knowledge, Perception, Students, Ghana

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### INTRODUCTION

The advent of technology, its use and implementation has found its way into the field of medical practice in different forms. One of such technological development in the healthcare system is telemedicine. Telemedicine is the application of information and communication technology to provide healthcare access remotely including diagnosing, treating and evaluating patients through remote information exchange (Brown 1995). Telemedicine technologies have been in use for some time in the developing world, but on a relatively smaller scale compared to developed countries. Telemedicine in the veterinary perspective is a subcategory of telehealth that involves the digital exchange of information from a distance regarding a patient's clinical health status within an existing Veterinarian-Client-Patient-Relationship (VCPR) (American Veterinary Medical Association, 2019). Advantageously, telemedicine provides intra and inter hospital communication, cuts down the cost associated with providing quality healthcare, eliminates the need to construct new hospital facilities, which developing countries like Ghana generally lack (Wootton *et al.*, 2011). In spite of the benefits derived from the use of telemedicine, the receptivity of the advancement in medicine, is generally a necessary precondition for sustained telemedicine use (Kirsten *et al.*, 2019). More to the point, the knowledge, perception and attitudes toward telemedicine are likely to influence the nature telemedicine will take and it will play a central role in determining its ultimate success (Kirsten *et al.*, 2019). In Ghana, telemedicine seems to be a new wave

of technological advancement in health care system but the understanding and perception of the populace has not contributed much to its successful implementation. According to literature, an appreciable collection of research has focused on the knowledge, perception and attitudes towards telemedicine (Ayatollahi *et al.*, 2015, Frimpong *et al.*, 2016, Biruk *et al.*, 2018, Mohamed *et al.*, 2020). Most of these studies have been geared more towards the clinicians, health professionals and postgraduate medical students as well as that of veterinarians' receptivity and adoption of telemedicine (Watson *et al.*, 2019) with little focus on the knowledge and perception of telemedicine amongst veterinary medical students.

It is expedient to note that the perceptions of veterinary students, is desirable in the bid to the extensive adoption, use and the improvement of telemedicine in Ghana especially during this COVID pandemic. With this background knowledge and the existing research gap, this research work was conducted to evaluate the knowledge and perception of telemedicine among veterinary students in Ghana. The outcome of this study will be useful in the design and implementation of intervention programs to improve telemedicine usage and practice among veterinary students in Ghana.

### MATERIALS AND METHODS

**Research Design and Study Area:** This study was designed as a cross-sectional survey to assess the knowledge

and perception of telemedicine among veterinary students in Ghana. The study area was focused on the two main Schools of Veterinary Medicine (SVM) in Ghana. These were the SVM in Kwame Nkrumah University of Science and Technology (KNUST) in Kumasi – Ghana and SVM in University of Ghana (UG), Legon, Accra-Ghana. These two Schools of Veterinary Medicine operate a 6-years academic programme with students in first, second and third years of study classified as pre-clinical students whilst students in clinical years are those in fourth, fifth and sixth years of study respectively.

#### Study Population, Sampling technique and sample size:

The study population in this current research comprised all the students of the two Schools of Veterinary Medicine in Ghana. The overall population of the students in the two Schools of Veterinary Medicine as at the time of data collection for this current study stood at a total of two hundred and eighty-three (283) students in different years of study: 185 students in SVM-KNUST and 98 students in SVM-UG. Characteristically, the student population comprised of different individuals with different socio-economic backgrounds and from different ethnicities including some international students from some African countries including Sierra Leone, Tanzania, Nigeria and Uganda.

The sampling technique employed for this study was the simple random sampling technique. This method of sampling technique was used so as to avoid biases on the part of the researcher as well as to ensure that each student was provided with the chance of being selected to be a part of the respondents for this study. A total of one hundred and fourteen (114) students were able to give responses to the administered questionnaires within the time frame of the study. This number of students served as the sample size used in this study.

**Data collection instrument and procedure:** In this study, a well-structured questionnaire (Additional file 1: Telemedicine Questionnaire) which was designed by researchers with the help of Google Forms served as the data collection instrument. The questionnaire comprised questions on the demographic characteristics of the respondents as well as the questions on the knowledge of telemedicine and the perceived utilisation, benefits, complexity and disadvantages of telemedicine among veterinary students. The questionnaires were successfully administered to the respondents after obtaining their consent. Students were contacted via Student Association WhatsApp platforms, informing them of the research study, its purpose, and a link to an online questionnaire. A constant daily reminder of the questionnaire was submitted to the student WhatsApp platforms as well as to the students. The responses to the questionnaires were retrieved from Google Forms in a Microsoft Excel format by the researcher after a one-month time frame of data collection (from August, 2020 to September, 2020) has elapsed.

In data collection on knowledge of the students, a ‘Yes’ or ‘No’ format was used in assessment of the knowledge part. A score of ‘1’ was given for ‘Yes’ and ‘0’ for ‘No’. A student can score a minimum of 0 and a maximum of 8 in this section. An average score of 4 (50%) from the eight

questions was used as a cutoff point to determine the level of knowledge of telemedicine. The mean knowledge score of less than 4 (50%) was labeled as poor whilst a mean knowledge score of greater than 4 (50%) was labelled as good. With perception, questions were rated on a 5- point Likert scale that ranged from ‘1=strongly disagree’ to ‘5=strongly agree. Mean scores were calculated and a mean of less than 2.5 (50%) was labeled as poor, 2.6 (51%)–3.0 (60%) as moderate, and greater than 3.0 (60%) is labeled as good.

**Data Analysis:** Statistical data analysis was performed on all the data collected using Statistical Package for Social Sciences (SPSS Version 20). Descriptive statistics were used to analyse the demographic characteristics as well as the students’ knowledge and perception of telemedicine. Data was summarized using mean, standard deviation in quantitative data and using frequency and percentages for categorical data. Pearson Chi-square test was used to determine the significant association between categorical variables which were grouped. Statistical significance was tested at 5% significance level or 95% confidence interval which meant that p-values less than .05 were considered as statistically significant.

## RESULTS

### Demographic Characteristics of students

Results obtained for the demographic characteristics of the veterinary students are displayed in Table 1 below. The findings indicated that out of the one-hundred and fourteen (114) respondents, 78 respondents representing 68.4% were below 22 years of age whilst the remaining 36 respondents representing 31.6% were above 22 years of age. Findings on gender of the respondents showed that 73.7% of the respondents were males whilst the remaining 26.3% were females. The religious affiliation of the respondents indicated that 94.7% were Christians whilst 7.9% were Muslims. In terms of the marital status of the respondents, 94.7% of the respondents were unmarried whilst 5.3% were married. The findings showed that 57.9% of the respondents were clinical year students in year 4 to year 6 whilst the remaining 42.1% of the respondents were preclinical year students in year 1 to year 3 (Table 1).

**Table 1:**  
Veterinary students’ demographic characteristics

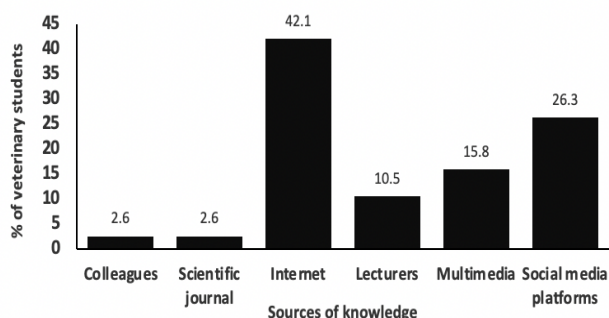
Variable	Category	Frequency (n)	Percentage (%)
Age	<22	36	31.6
	>22	78	68.4
Gender	Male	84	73.7
	Female	30	26.3
Religion	Christianity	105	92.1
	Islam	9	7.9
Marital Status	Single	108	94.7
	Married	6	5.3
Year of Study	(Year 1- Year 3)	48	42.1
	Clinical (Year 4-Year 6)	66	57.9

Values are expressed in frequencies and percentages except otherwise stated

**Table 2:**  
Veterinary students' response to survey questions on knowledge of telemedicine

Questions on knowledge of Telemedicine	Response		Overall knowledge (Mean and SD)
	Yes	No	
Have you heard of the term 'telemedicine'	105 (92.1%)	9 (7.89%)	4.947 ± 1.374
Have you seen a telemedicine system before	15 (13.2%)	99 (76.8%)	
Are you familiar with tools like teleconference or teleconsultation	51 (44.7%)	63 (54.3%)	
Telemedicine is useful in continuing medical diagnosis	96 (84.2%)	18 (15.8%)	
It is useful in chronic disease management and surgery	87 (76.3%)	27 (23.7%)	
It disseminates patient health information from one department to another	96 (84.2%)	18 (15.8%)	
Telemedicine provides sufficient understanding of a patients problem	66 (57.9%)	48 (42.1%)	
It does not includes administrative meetings and continuing medical education	84 (73.7%)	30 (27.3%)	

**Sources of knowledge on Telemedicine:** In addition, the study sought to examine the sources from which the veterinary students obtained the knowledge of telemedicine. The findings are displayed in Figure 1 below. The results indicate that 42.1% of the obtained information on telemedicine from the internet, 26.3% obtained their information from social media platforms, 15.8% obtained their knowledge of telemedicine from multimedia (radio, television) whilst 10.5% of the respondents had knowledge of telemedicine from their lecturers. Colleagues were cited by 2.6% of the students as their source of knowledge of telemedicine whilst 2.6% also cited scientific journals as their source of knowledge on telemedicine (Figure 1 below).

**Figure 1:**  
Response on the source of veterinary students' knowledge of telemedicine.

**Perception towards Telemedicine:** This study examined the perception of veterinary students with respect to the utilization, benefits, complexity and disadvantages of telemedicine. The findings as shown in Table 3 below indicated that the veterinary students have an overall good perception toward telemedicine with a mean of  $3.473 \pm 1.115$ . The recorded mean response for utilization and benefits of telemedicine was  $3.65 \pm 1.105$  whilst that of complexity and disadvantages of telemedicine was  $3.05 \pm 1.139$ . The mean responses indicate clearly that the students had a very good perception of how beneficial telemedicine can be to the veterinary practice as well as the possible disadvantages that will be encountered in the adoption and usage of telemedicine in veterinary practice.

With respect to the utilization and benefits of telemedicine, 76.3% of the respondents responded by agreeing that telemedicine will help capture and store medical information for future use. 44.7% of the students were confident that telemedicine will reduce cost of patients assessing healthcare services whilst 36.8% were neutral. Majority of the students (57.9%) agreed that telemedicine

will increase doctor and patient communication. 31.6% of the students agreed that medical errors can be reduced when telemedicine is used while 42.1% were neutral.

A greater percentage (67.2%) of the students indicated that telemedicine will reduce visits to veterinary clinics. It was agreed by 71% of the respondents that telemedicine use can held quick healthcare delivery while 50% agreed that telemedicine has the ability to enhance emergency medical delivery as well as 63.1% agreed to the likelihood of an increase in the number of patients to be attended to when telemedicine is adopted in veterinary practice (Table 3). With telemedicine improving clinical decisions in veterinary practice, facilitating effective and efficient diagnosis, enhancing quality of healthcare delivery, and reducing the number of hours to be used in surgery, 50%, 42.1%, 63.1% and 23.7% of the students respectively agreed to the above mentioned benefits of telemedicine whilst 50% of the students disagreed with telemedicine having the ability to reduce the time to be used in veterinary surgeries (Table 3).

With respect to the perceived complexity and disadvantages of telemedicine, majority of respondents (55.3%) agreed that telemedicine will add extra responsibility to the healthcare provider and 34.3% agreed telemedicine is not cost-effective to use in veterinary practice. Concerning telemedicine threatening patient information privacy, 39.5% agreed to it whilst 34.2% remained neutral. Telemedicine adoption and use in veterinary medicine being a tedious and stressful process was agreed upon by 23.6% of the respondents whilst most of the students (57.9%) remained neutral. With the issue telemedicine being perceived as not an effective use of time in veterinary practice, 60.5% of the students disagreed whilst 7.9% agreed to telemedicine being an ineffective use of veterinary practice (Table 3).

**Overall Knowledge and Perception of Veterinary Students towards Telemedicine:** The results on the overall knowledge and perception of veterinary students with respect to telemedicine are displayed in Table 4 below. The findings showed that, 99 (86.8%) of the students had a good knowledge of telemedicine whilst 15 (13.2%) had poor knowledge of telemedicine. In terms of perception, 90 (78.9%) of the students had a good perception on telemedicine, 21 (18.5%) of the respondents recorded a moderate perception on telemedicine whilst only 3 (2.6%) had a poor perception toward telemedicine in terms of its benefits, utilization, complexity and disadvantages (Table 4).

**Table 3:**  
Perception of Telemedicine among veterinary students

	SD	D	N	A	SA	Mean & SD
<b>Utilisation and Benefits of Telemedicine</b>						
Capture and store medical information for future use	0 (0.0%)	6 (5.3%)	21 (18.4%)	30 (26.3%)	57 (50%)	4.21±0.935
Reduce cost of patients assessing health care services	6 (5.3%)	15 (13.2%)	42 (36.8%)	18 (15.8%)	33 (28.9%)	3.50±1.202
Increase doctor and patient communication	3 (2.6%)	12 (10.5%)	33 (28.9%)	18 (15.8%)	48 (42.1%)	3.84±1.175
Medical error in veterinary practice can be reduced	9 (7.9%)	21 (18.4%)	48 (42.1%)	15 (13.2%)	21 (18.4%)	3.16±1.175
Telemedicine reduces visits to veterinary clinics	3 (2.6%)	15 (13.2%)	21 (18.4%)	30 (26.3%)	45 (39.5%)	3.87±1.095
Telemedicine can help quick healthcare delivery	0 (0%)	9 (7.9%)	24 (21.1%)	39 (34.2%)	42 (36.8%)	4.00±0.959
Enhance emergency medical delivery	9 (7.9%)	6 (5.3%)	42 (36.8%)	24 (21.1%)	33 (28.9%)	3.58±1.030
Increases number of patients attended to in veterinary practice	3 (2.6%)	9 (7.9%)	30 (26.3%)	30 (26.3%)	42 (36.8%)	3.87±1.095
Improve clinical decisions in veterinary practice	0 (0.0%)	12 (10.5%)	45 (39.5%)	18 (15.8%)	39 (34.2%)	3.74±1.057
Facilitates effective and efficient medical diagnosis	3 (2.6%)	6 (5.3%)	57 (50%)	18 (15.8%)	30 (26.3%)	3.58±1.200
Enhance quality of health care delivery	3 (2.6%)	9 (7.9%)	30 (26.3%)	33 (28.9%)	39 (34.2%)	3.84±1.079
Reduce the number of hours used in veterinary surgery procedures	24 (21.1%)	33 (28.9%)	30 (26.3%)	15 (13.2%)	12 (10.5%)	2.63±1.261
<b>Utilisation and benefits total mean response</b>						<b>3.65±1.105</b>
<b>Complexity and Disadvantages of Telemedicine</b>						
Adds extra responsibility to the healthcare provider	3 (2.6%)	12 (10.5%)	36 (31.6%)	27 (23.7%)	36 (31.6%)	3.71±1.113
Not cost-effective to use in veterinary practice	15 (13.2%)	24 (21.1%)	36 (31.6%)	24 (21.1%)	15 (13.2%)	3.00±1.230
Threatens patient information privacy in healthcare delivery	18 (15.8%)	13 (11.4%)	39 (34.2%)	30 (26.3%)	15 (13.2%)	3.11±1.247
Telemedicine adoption and use in veterinary medicine is a tedious and stressful process	9 (7.9%)	12 (10.5%)	66 (57.9%)	9 (7.9%)	18 (15.7%)	3.13±1.070
Telemedicine use is not an effective use of time in veterinary practice	27 (23.7%)	42 (36.8%)	36 (31.6%)	3 (2.6%)	6 (5.3%)	2.29±1.037
<b>Complexity and Disadvantages total mean response</b>						<b>3.05±1.139</b>
<b>Overall Perception Mean Response</b>						<b>3.473±1.115</b>

**Table 4:**  
Level of knowledge and Perception of Telemedicine

Parameter	Level	Frequency (n)	Percentage (%)
Knowledge of telemedicine	Good	99	86.8
	Poor	15	13.2
Perception towards telemedicine	Good	90	78.9
	Moderate	21	18.5
	Poor attitude	3	2.6

**Demographic characteristics and knowledge of telemedicine:** Findings on the effects of demographic characteristics of the veterinary students on the knowledge of telemedicine were displayed on Table 5 below. Generally, the knowledge level was good; however, the knowledge level of telemedicine among the students was not significantly ( $P>0.05$ ) related to their age ( $P=0.084$ ), religion ( $P=0.214$ ), and marital status ( $P=0.236$ ), but was statistically significant ( $P<0.05$ ) with the gender ( $P=0.043$ ) and year of study ( $P=0.025$ ) of the students.

With respect to gender, more male students (63.1%) had a good knowledge of telemedicine as compared to the female students (23.7%). According to the year of study, more clinical students (52.6%) had good knowledge of telemedicine as compared to the preclinical students (34.2%). These differences in knowledge level were statistically significant ( $P<0.05$ ).

**Demographic characteristics and perception Towards telemedicine:** Findings on the relatedness of demographic characteristics of the veterinary students to their perception of telemedicine were displayed in Table 6 below. From the findings, the general perception of telemedicine was good

among the various categories of the demographic variables. Nevertheless, the differences in the students' perception was not significantly ( $P>0.05$ ) related to their age ( $P=0.189$ ), religion ( $P=0.887$ ), marital status ( $P=0.993$ ), gender ( $P=0.464$ ) and year of study ( $P=0.280$ ) of the students (Table 6).

**Table 5:**  
Relationship between student demographics and knowledge of telemedicine.

Variable	Category	Level of Knowledge		$\chi^2$	P-value
		Good	Poor		
Age	<22	27 (23.7%)	9 (7.9%)	9.158	0.084
	>22	72 (63.1%)	6 (5.3%)		
Gender	Male	72 (63.1%)	12 (10.5%)	12.066	0.043*
	Female	27 (23.7%)	3 (2.6%)		
Religion	Christianity	90 (78.9%)	15 (13.2%)	8.662	0.214
	Islam	9 (7.9%)	0 (0%)		
Marital Status	Single	93 (%)	15 (%)	11.259	0.236
	Married	6 (%)	0 (0.0%)		
Year of Study	Preclinical	39 (34.2%)	9 (7.9%)	3.218	0.025*
	Clinical	60 (52.6%)	6 (5.3%)		

\* = statistical significance at 5% significance level ( $p<0.05$ ).

## DISCUSSION

This current study examined the knowledge and perception of telemedicine among Ghanaian veterinary medical students. The findings revealed that students enrolled in veterinary school in Ghana have a relatively good knowledge of telemedicine with a mean response of 4.947 ± 1.374 which represented 86.8% of the students.

**Table 6:**  
Relationship between student demographics and perception of telemedicine

Variable	Category	Level of Perception			$\chi^2$	P-value
		Good	Moderate	Poor		
Age	<22	36 (31.6%)	0 (0.0%)	0 (0.0%)	22.187	0.189
	>22	54 (47.4%)	21 (18.4%)	3 (2.6%)		
Gender	Male	69 (60.5%)	12 (10.5%)	3 (2.6%)	18.231	0.464
	Female	21 (18.4%)	9 (7.9%)	0 (0.0%)		
Religion	Christianity	84 (73.7%)	18 (16.1%)	3 (2.6%)	21.956	0.887
	Islam	6 (5.3%)	3 (2.6%)	0 (0.0%)		
Marital Status	Single	84 (73.7%)	21 (18.4%)	3 (2.6%)	14.602	0.993
	Married	6 (5.3%)	0 (0.0%)	0 (0.0%)		
Year of Study	Preclinical	45 (39.5%)	3 (2.6%)	0 (0.0%)	19.198	0.280
	Clinical	48 (42.1%)	18 (16.1%)	3 (2.6%)		

From the findings of this study, the major source of information was the internet and social media platforms while the information through the lecturers was low. This outcome however showed the need for the incorporation of the concept of telemedicine in the curriculum of veterinary medicine thereby making lecturers the major source of information on telemedicine. In this study, majority of the students (92.1%) had heard of the term 'telemedicine' which is similar to reports of Ameh (2008) among medical school students in Nigeria but higher than the report of Gour and Srivastava (2010) who indicated 58% of the students have heard of telemedicine in India. The differences in the outcomes could be due to geographical location as well as technological advancement of the countries involved.

In spite of hearing of telemedicine, 45.7% of the students were familiar with teleconferencing and teleconsultation while 76.8% of the students have not seen a telemedicine system. This could be attributed to the challenges with telecommunication infrastructure development in resource limited country with lack of telemedicine systems in hospitals and veterinary medical schools for teaching and learning purposes. The use of telemedicine to help in continual medical education as well as to disseminate patient health information from one department to another was known by 84.2% respondents. This finding is in accordance with report of Frimpong *et al.*, (2016) where 90% of the respondents affirmed that telemedicine is a very useful tool in medical information sharing among health workers in Ghana.

Although it was observed that there is an increase in the knowledge base of veterinary students on telemedicine, this was statistically significant ( $p < 0.05$ ) with the gender ( $p = 0.043$ ) and year of study ( $p = 0.025$ ) of the students. The significance in the knowledge of telemedicine as related to the gender could be attributed to the fact that more male students are enrolled into the veterinary programme in Ghana. The good knowledge of telemedicine exhibited by the clinical students (52.6%) than preclinical students (34.2%) could be as a result of the exposure of the clinical students to veterinary clinical practices and the need for advancements in a technologically advancing world while the preclinical students are adjusting to the basics and theoretical aspects of the veterinary training.

The perception of students on the utilisation, benefits, complexity and disadvantages of telemedicine among the veterinary students was good with a mean response of  $3.473 \pm 1.115$  represented by 78.9% of the students used in

this study. This finding is in agreement with the findings of Hawk (2018) who indicated that veterinary students among other younger veterinarians held a more positive attitude and perception towards the use of telemedicine especially with the changing world.

This current study furthermore revealed that the students agreed that telemedicine will advantageously reduce visits to veterinary clinics (65.8%) ensure quick healthcare delivery (71.0%), enhance emergency medical delivery (50%), increase the number of patients to be attended to (63.1%) as well as facilitate effective and efficient diagnosis (42.1%) in veterinary practice. This perception from the students in this study buttresses the current position of governments on healthcare delivery in this era of COVID-19, which has created a path of reduced physical contact with humans. The responses of the students however are in accordance with use of telemedicine in veterinary practice being the way forward since there is the possible elimination of that fear of the clinician or the client contracting infectious diseases which are either nosocomial and or contagious in nature.

The use of communication devices such as telephones, video chats among others in the practice of telemedicine will enhance the work of the veterinarian as a lot of patients can be reached across the country especially in rural areas and also ensure the timely intervention of a veterinarian to save a patient in cases where time is a crucial factor and distance is a barrier.

The benefits of telemedicine improving clinical decisions in veterinary practice, reducing cost of patients assessing healthcare services, and facilitating effective and efficient diagnosis was agreed by 50%, 44.7% and 42.1% of the students in this study. These findings come to shed more light on previously reported benefits of telemedicine in veterinary practice (Bishop *et al.*, 2015). This shows that in the use of telemedicine in veterinary practice, client comfort in accessing veterinary services will be ensured as well as the financial burdens comprising of transportation costs among other unforeseen costs will be reduced. Based on these perceptions, the adoption and usage of telemedicine in veterinary practice can help address the current short falls of delivering veterinary care in Ghana which includes reduced number of veterinary clinics in an area, distance barriers, among others. Individuals and farmers living in remote areas can still enjoy the services of veterinarians without stressing their animals through transportation of such ill

animals over longer distance travels to receive veterinary care (Bishop *et al.*, 2015, Bragg *et al.*, 2015).

Again this current study has shown that 76.3%, 57.9% and 63.1% of the students were in agreement to telemedicine being helpful in the capture and the storage of medical information for future use, increase doctor and patient communication, and enhance the quality of healthcare delivery respectively. These perceived benefits indicate that telemedicine will ensure effectiveness in the field of work on the part of the veterinarians. In addition, clinically unusual yet useful cases and their outcomes can be properly stored and retrieved for future reference to clients as well as useful in teaching and learning purposes.

Nevertheless, with the issue of telemedicine reducing the number of hours to be used in surgery, only 23.7% of the students agreed to it. This shows that most of the students perceive that it will be quite challenging when using telemedicine during surgery. This perception could be attributed to the non-exposure of veterinary students to the feasibility of telemedicine use in surgical sessions in Ghana. The adoption of telemedicine was agreed by the students that it will add extra responsibility to the veterinarians (55.3%). These extra responsibilities could be in the form of either ensuring technical effectiveness and efficiency of the telemedicine system or performing administrative and legal responsibilities which have not been the routine of veterinarians in recent times. These concern as raised in this study corroborates the findings of other studies conducted by Joseph *et al.*, (2007) and Sheikhtaheri *et al.*, (2016) where clinicians and hospital workers were much more concerned about the extra responsibilities associated with telemedicine adoption in the form of both administrative and legal responsibilities.

Telemedicine was also deemed by 34.3% of the students as not cost-effective in veterinary practice. The non-cost-effectiveness as indicated by some of the students could be in the form of the cost involved in purchasing a telemedicine system, installation and its maintenance which could be perceived to be relatively high as compared to the traditional way used by veterinarians in carrying out their practice. In addition, some students (39.5%) in this study raised the concern of telemedicine having the capability of threatening patient information privacy and hence can defeat client's information confidentiality; which is a major concern for most clients. These concerns corroborate the perception of healthcare policy makers in a study conducted by Alaboudi *et al.*, (2016). Isabalija *et al.*, (2011) also in their study reported the issue of client information confidentiality as one of the factors affecting the implementation and adoption of telemedicine in Uganda. Therefore, for a successful implementation of telemedicine in veterinary practice in Ghana, securing patient information confidentiality should be of utmost importance and consideration.

In conclusion, based on the outcome of this current study, it was concluded that the veterinary students in Ghana exhibited very good knowledge of telemedicine of which their major source of knowledge was from the internet. They also possessed a good perception of the benefits, utilisation, complexity and disadvantages of telemedicine. However, their exposure to a telemedicine system is low. The gender and level of study had a significant effect on level of knowledge of telemedicine among veterinary medicine students. Furthermore, the issue of patients' information

privacy being threatened by the usage of telemedicine was indicated by the students.

It is recommended that administrators and educational policymakers should acknowledge, develop and incorporate the teaching of telemedicine in the curriculum in the formative years of veterinary students training; so as to enhance the adoption and usage of telemedicine in veterinary medicine training and practice in the COVID era. Furthermore, it is important to establish a working telemedicine centre in the school of veterinary medicine to ensure effective and efficient training of students in telemedicine

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