Determinants of Telemedicine Acceptance among Doctors-to-the-Barrios (DTTBs) in the Philippines

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ABSTRACT

Background. Telemedicine offers a solution to healthcare access issues, especially during the COVID-19 pandemic when physical distancing limited in-person visits. It can also be used by the Doctors-to-the-Barrios (DTTBs), who are often newly licensed physicians who have not undergone residency training yet, to remotely consult specialists and assist them in providing better healthcare recommendations to their patients. Understanding the acceptance of telemedicine particularly among DTTBs is crucial to optimizing its implementation, as local studies on this topic are lacking.

Objective. The purpose of this study is to determine the factors affecting acceptance of telemedicine by the DTTBs.

Methods. This study employed a descriptive and analytical cross-sectional research design from 2021 to 2022. Ethical approval was obtained prior to study implementation. Informed consent form was sent to all enrolled master's students in the DTTB program. The study adapted the questionnaire utilized by Zailani et al. using a five-point Likert scale to identify the determinants of acceptance of telemedicine based on the following constructs: government policy, external supplier's capacity, project team's capacity, top management support, perceived usefulness, attitude, self-efficacy, acceptance of telemedicine, and organizational culture. Linear regression was performed to identify significant constructs that determine acceptance of telemedicine. All data were reported at 95% confidence interval.

Results. total of 116/180 DTTBs participated in the study. Attitude (β=0.5849, $p<0.01$) and self-efficiency (β=0.5327, $p<0.01$) together with organizational culture had a significant positive impact on the acceptance of telemedicine.

Conclusion. This study shows the current state of acceptance of telemedicine by our DTTBs. It highlights their positive attitude and self-efficiency towards telemedicine and the lack of support they receive from the government in funding and implementing telemedicine efforts despite its potential to address healthcare access issues.

Keywords: telemedicine, telerehabilitation, community medicine

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INTRODUCTION

In the age of technological advancements, the field of medicine is constantly evolving in providing healthcare beyond the confines of a clinic or hospital.[1] Through information and communication technology, telemedicine provides a potentially effective solution to public health

issues, such as the lack of access to healthcare, increasing rates of chronic diseases, and the shortage of healthcare professionals.[1] Although it is considered to be a promising innovation in healthcare, little is published locally about the level of acceptance and effectiveness of telemedicine in the Philippine setting.

It is understandable that telemedicine was leveraged during the Coronavirus Disease 2019 pandemic, which has altered the traditional in-person access to essential services, including healthcare. In March 2020 and certain subsequent months, the Philippines was placed in a nationwide Extended Community Quarantine (ECQ), which enforced physical distancing restricting in-person interactions, including outpatient non-urgent health-related visits.[2] Post-pandemic, one major change that has become part of the "new normal" in some, if not all, healthcare institutions, is the use of telemedicine to seek consultation. Telemedicine has become a vital part of healthcare providers' armamentarium in evaluating and treating patients from a distance.

In the Philippines, we have approximately 180 general physicians deployed to various geographically isolated disadvantaged areas (GIDA) under the Doctors-to-the-Barrios (DTTB) program of the Department of Health (DOH). Many of them, who are often newly licensed and have not undergone residency training, need assistance from fellow or senior physicians for various complex or specialized cases. Seeking to ensure they provide accurate and safe healthcare recommendations for such cases, DTTBs utilize telemedicine (e.g., using their mobile devices) to reach out to specialists to help them better manage their patients. However, their telereferrals are subject to various constraints, such as technical challenges (e.g., lack of reliable internet), data privacy issues, lack of availability and/or willingness of specialists to receive telereferrals, and lack of administrative support for telemedicine.

A qualitative study in Malaysia on the readiness of telemedicine, specifically telerehabilitation (a subset of telemedicine focused on the remote delivery of rehabilitation therapy services), found the following as barriers: lack of urgency to change/innovate, lack of awareness of physicians and local government regarding telerehabilitation, lack of stakeholders' involvement in planning, lack of exposure on e-healthcare knowledge, resistance to change, technical challenges with use of relevant hardware and software, and lack of reliable internet connectivity.[3] However, locally there has yet to be a similar study especially in far-flung areas wherein DTTBs are deployed. As physicians are often the drivers of change, we first sought to determine the DTTBs' acceptance of telemedicine, which has been studied to be influenced by various factors. These factors or determinants need to be identified, explored, and eventually addressed to optimize the implementation of any telemedicine-related endeavors.

Therefore, this study aimed to determine the factors that influence telemedicine acceptance among the DTTBs in terms of the following constructs: government policy, external supplier's capacity, project team's capacity, top management support, perceived usefulness, attitude, self-efficacy, DTTB's acceptance of telemedicine, and organizational culture.

METHODS

Study Design

This was a descriptive and analytical cross-sectional research.

Study Population and Sampling

According to the website and human resources division of the DOH, the DTTB program at the time of this study was on its 37th batch, which consisted of 180 active DTTBs. The doctors were deployed to rural health units of different provinces throughout the Philippines for a minimum of two years. Prior to the pandemic, they convened in Manila every six months to attend lectures for completion of their Masters in Public Management, with Major in Health Systems Development (MPM-MSD).[4] However, due to the social distancing protocols and difficulties in traveling during the pandemic, DTTBs were allowed to attend their master's classes online. Our study was based at the Philippine General Hospital (PGH), but the DTTBs were allowed to participate in our online survey from any location convenient to them.

The total population (N) of participants was 180, while the study sample size (n) was computed to be at 130 with 0.05 margin of error or 95% confidence level. Purposive sampling was used. Any physician who was enrolled to the DTTB program from 2021-2022 was invited to participate via e-mail. DTTBs who had limited to no internet access or had no working telecommunication devices (e.g., mobile phones, laptops, computers, tablets) at the time of study were excluded. Those who were not able to accomplish or finish the survey for any reasons after submission of informed consent were withdrawn from the study.

Data Collection

The study flow diagram is presented in Appendix A. Approval from the University of the Philippines Manila Research Ethics Board (UPMREB) and permissions from the DOH and the DTTB program director were obtained prior to the study conduct. The potential participants received an email containing an invitation to the study and the survey link. A waiver of signed consent (i.e., implied consent by completing the questionnaire) was attached to the email. A total of two months from the time of approval by UPMREB was allotted for recruitment and data collection. Another two months were spent for data analysis and manuscript writing.

A pretest on ten alumni of the DTTB program was conducted to help clarify and revise unclear items in the questionnaire. The self-administered Google survey contained questions on demographics and factors that determine acceptance of telemedicine. It could be accomplished in less

than ten minutes and was accessible anytime and anywhere within one month from the time the e-mail was sent out.

The primary investigator was responsible in collecting the data and ensuring that there were no missing data. A research assistant transcribed and tabulated the responses. A statistician was employed to perform appropriate data analysis. Both research assistant and statistician were employed and granted study access by the Department of Rehabilitation Medicine at PGH after signing a non-disclosure agreement. Both of them were oriented and trained by the principal investigator on how to access, transcribe, tabulate, and secure the study data.

We adapted the questionnaire utilized by Zailani et al. in a similar study about the determinants of telemedicine acceptance in public hospitals in Malaysia.[5] In their study, the questionnaire included 41 agree-disagree statements using a five-point Likert scale to identify the determinants of acceptance of telemedicine. The following constructs of their questionnaire were based on extensive literature review and adapted from Shaqrah,[6] Hsiao et al.,[7] Whitten et al.,[8] Kifle et al.,[9] Venkatesh,[10] Chau and Hu,[11] and Straub et al.[12]: government policy, external supplier's capacity, project team's capacity, top management support, perceived usefulness, perceived ease of use, attitude, self-efficacy acceptance of telemedicine, and organizational culture. Validity and reliability were established for the questionnaire.[5] For this study, the original questionnaire was modified replacing the word "hospital" with "Local Health Unit (LHU)" to fit the common DTTB practice setting. The questionnaire was then validated for the Filipino setting.

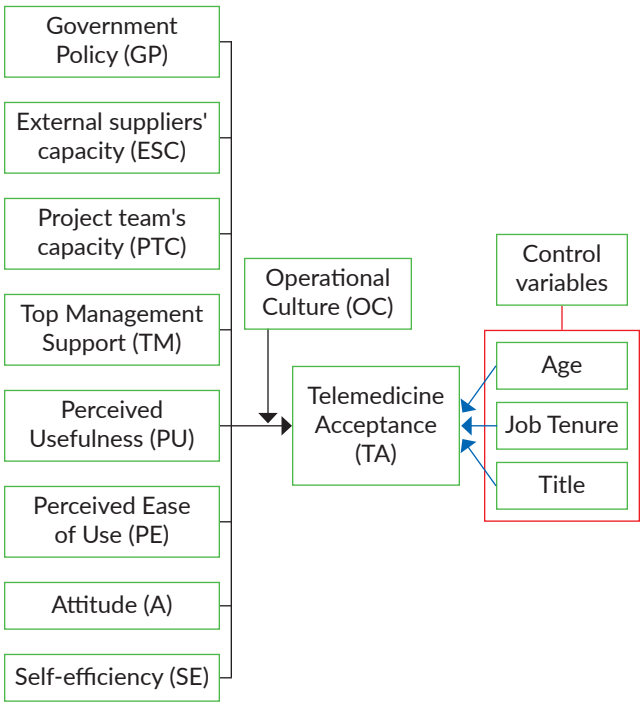

Figure 1. Conceptual framework of the study, adopted from Zailani et al.[5]

Figure 1 shows the relationships of the independent variables (i.e., age, job, tenure, class of municipality, government policy, external suppliers' capacity, top management support, perceived usefulness, attitude, self-efficacy, and organizational culture) and the dependent variable, which is the acceptance of telemedicine.

In the study of Zailani et al., they identified through meta-analysis four main drivers of acceptance of telemedicine. These are environmental, organizational, technological, and individual factors, which were further subclassified into eight subfactors. For the environmental factors, subfactors identified were government policy and capability of external suppliers. For the organizational factors, subfactors identified were project team's capability and top management support. For the technological factors, subfactors identified were perception of usefulness and ease of use. Lastly for individual factors, subfactors identified were attitude and computer self-efficacy/efficiency.[5]

In the context of organizational culture, this construct refers to the organization's norms and values that may either prevent or encourage members' maximum effort to adopt telemedicine.[13] Although few researches have been made regarding the influence of organizational culture on acceptance of telemedicine, Zailani et al. said that those researches pointed a strong contextual influence of organizational culture. Furthermore, they identified five dominant perspectives in adopting technology: environmental, organizational, technological, and managerial factors, and interactionism. Among these, it is interactionism that enables all the other factors to be treated in one dynamic framework. As a result, there seems to be co-influence among all these factors in the adoption of technology. Thus, the interactionism perspective was used by Zailani et al. to explore the main factors of telemedicine adoption.[5] In order to control the variation of acceptance of telemedicine caused by the aforementioned factors, age, job tenure, and job title were considered as control variables.

Statistical Analysis

The demographic characteristics of the participants and primary outcome parameters were summarized and tabulated using descriptive statistics. The validity and reliability of the reflective model were assessed in terms of internal consistency, convergent, and discriminant validity based on composite reliability, average variance extracted, and the correlation of the constructs.

The Partial Least Squares Structural Equation Modeling was performed to assess the significance of each latent variable to the acceptance of telemedicine. Organizational culture was also evaluated for moderating effect on each latent variable in their effect towards acceptance of telemedicine. The product indicator approach was conducted, and each interaction term with their individual constructs was added to the model.

Significant effects were identified based on their p-value at 5% level of significance. The computing programs used were Microsoft Office Excel 2016 and Stata 15.

RESULTS

A total of 116 out of 180 DTTBs participated in the study (response rate: 64.44%), with a mean age of 30±4.18 years (range: 24 to 60 years) (Table 1). More than half were female (62.07%), and the majority were single (77.59%). The regions most represented were Region VI with 16 doctors (13.79%), closely followed by Region VIII with 13 doctors (11.21%), and the Cordillera Administrative Region (CAR) and Bangsamoro Autonomous Region of Muslim Mindanao (BARMM) with 12 (10.34%) doctors each. The majority had nursing (30.17%) and biology and related courses (22.41%) as their pre-medicine courses. Ninety-three (80.17%) of them had 1 to 5 years of experience as a physician, and 56.9% had a length of service as a DTTB of more than two years.

More than 40% of the respondents had seen their patients through telemedicine or consulted with another doctor for their patients through telemedicine before the pandemic. Out of the 49 who had utilized telemedicine, 29.31% used applications with chat features, while 26.72% used short messaging service (SMS).

There was an increase in the number of doctors who implemented telemedicine in their practice before and during the pandemic, from 42.24% to 84.48%. In contrast to the amount of usage between chat and SMS before the pandemic, the number of SMS (51.72%) users exceeded the number of users of other means for telemedicine. Other commonly used modes of technology were voice call (48.28%), chat (44.83%), and video call (26.72%) (Table 1).

Government Policies on Telemedicine (GP)

Among the areas within the scope of government policies in the LHU, the supply of telemedicine was deemed by 44.83% of the respondents to be influenced by the government. This was closely followed by the demand for telemedicine being influenced by the government as observed by 40.52% of the sample (Appendix B). Meanwhile, the majority disagreed or strongly disagreed (52.59%) that government policies specifically create awareness and promotion of the use of telemedicine (Appendix B).

External Suppliers' Capacity (ESC)

The highest proportion of respondents strongly disagreed on the sufficiency of telemedicine development (36.21%), maintenance (37.93%), and training (50.86%) within their LHU (Appendix B).

Project Team's Capacity (PTC)

The largest percentage of respondents strongly disagreed to having qualified project team/staff for telemedicine (54.31%), formally established telemedicine responsibilities (58.62%), understanding of the medical needs of the different departments in their respective LHUs (42.24%), and capable information system for the development of telemedicine in their areas (47.41%) (Appendix B).

Top Management Support (TM)

At least half of the participants (53.45%) believed that the senior management (e.g., Mayor or the LGU) in their local areas is a key factor in telemedicine programs. The majority agreed or strongly agreed that the abilities of the senior management to take risks (69.83%) and provide adequate funding and other resources related to telemedicine (73.27%) are vital. However, only 18.97% received senior management support for telemedicine (Appendix B).

Perceived Usefulness (PU)

The majority agreed or strongly agreed that using telemedicine could improve their patient care (75.86%), increase their efficiency as a physician (73.28%), make their job easier (58.62%), help improve their performance (59.48%), and increase their productivity (64.65%) (Appendix B).

Perceived Ease of Use (EU)

The majority of the respondents found telemedicine to be easy to use and generally had a positive outlook at the overall ease of learning telemedicine and operating computers for telemedicine (Appendix B). Telemedicine interactions were perceived to be clear and understandable by 57.76% of the respondents.

Attitudes towards Telemedicine (A)

In general, the respondents showed a favorable attitude towards telemedicine as they found it simple or not complex (51.72%), beneficial to their patient care (59.49%), and fully integrated in providing patient care (48.28%) (Appendix B). However, 27.58% of the respondents were not in favor of telemedicine due to its lack of face-to-face interaction between patients and doctors, while 36.21% were neutral.

Self-Efficiency (SE) Domain on Telemedicine

More than half of the respondents had seen someone else use telemedicine before trying (55.17%) and could call someone for help when stuck (56.03%). Fifty-one out of 116 (43.96%) were able to get started with telemedicine without the help of someone else, and 55/116 (47.42%) did not need someone to show them how to do it. A little more than half (51.72%) were not given a lot of time to complete their job using telemedicine (Appendix B).

Acceptance of Telemedicine (TA)

Around 66 to 85% of the respondents showed positive responses to their acceptance of telemedicine: 66.38% would use telemedicine because of the problems at their LHU that it could address; 69.83% would promote telemedicine to others; 73.28% would increase their use of telemedicine

Table 1. Demographic Characteristics and Telemedicine Usage of Respondents (N = 116)

Demographic characteristics of respondents	Mean ± SD
Age	30.15 ± 4.18
	Frequency (%)
Sex	
Male	44 (37.93%)
Female	72 (62.07%)
Civil Status	
Single	90 (77.59%)
Married	25 (21.55%)
Separated	1 (0.86%)
Widow(er)	0 (0%)
Region	
Region I	4 (3.45%)
Region II	9 (7.76%)
Region III	1 (0.86%)
Region IV-A	4 (3.45%)
Region IV-B	7 (6.03%)
Region V	1 (0.86%)
Region VI	16 (13.79%)
Region VII	9 (7.76%)
Region VIII	13 (11.21%)
Region IX	4 (3.45%)
Region X	0 (0%)
Region XI	7 (6.03%)
Region XII	6 (5.17%)
Region XIII	11 (9.48%)
Cordillera Administrative Region	12 (10.34%)
Bangsamoro Autonomous Region of Muslim Mindanao	12 (10.34%)
Length of Service	
Less than 1 year	17 (14.66%)
Around 1-2 years	33 (28.45%)
More than 2 years	66 (56.9%)
Years as MD	
Less than a year	19 (16.38%)
1-5	93 (80.17%)
6-10	2 (1.72%)
>10	1 (0.86%)
None	1 (0.86%)

Demographic characteristics of respondents	Frequency (%)
Pre-medical Course	
Behavioral Science/Social Science/Psychology	6 (5.17%)
Biology and related courses	26 (22.41%)
Nursing	35 (30.17%)
Health Sciences, Public Health, INTARMED	10 (8.62%)
Medical Technology/Radiologic Technology/ Physical Therapy	8 (6.9%)
Others	4 (3.45%)
Not specified	27 (23.28%)
Used telemedicine BEFORE the pandemic	
Yes	49 (42.24%)
No	66 (56.9%)
Not sure	1 (0.86%)
Form of telemedicine, if applicable (n = 49)	
Call	0 (0%)
Chat	34 (29.31%)
E-mail	0 (0%)
SMS	31 (26.72%)
Video call	8 (6.9%)
Voice call	15 (12.93%)
Not specified	1 (0.86%)
N/A	67 (57.76%)
Used telemedicine DURING the pandemic	
Yes	98 (84.48%)
No	17 (14.66%)
Not sure	1 (0.86%)
Form of telemedicine, if applicable (n = 98)	
Call	1 (0.86%)
Chat	52 (44.83%)
E-mail	2 (1.72%)
SMS	60 (51.72%)
Video call	31 (26.72%)
Voice call	56 (48.28%)
Not specified	1 (0.86%)
N/A	18 (15.52%)

N/A - Not applicable, SMS - Short message service

in the future; and 85.35% would use telemedicine if it were implemented by their LHU. About 32% would use telemedicine for the reason that it was fully integrated in providing patient care at their LHU (Appendix B).

Organizational Culture (OC) towards Telemedicine

A large majority of the respondents disagreed with all the statements related to organizational culture towards telemedicine (Appendix B). Many either disagreed or strongly disagreed that adequate telemedicine training was provided (81.03%) and that senior managers were actively leading the deployment of telemedicine in their respective LHUs (65.52%). The majority of their work areas neither rewarded technology progress nor encouraged continuous improvements in knowledge and skills related to telemedicine.

Measurement Model Results

A reflective model was built to measure the tool's reliability, and convergent and discriminant validity. The factor loadings, which assessed individual-item reliability, were mostly greater than 0.5, except for items 11, 28, 29, and 37 (Table 2). Hair et al.[15] suggested that measurements with a loading higher than 0.7 should be accepted, while Chine[13] argued that variables with a loading less than 0.5 should be dropped. In the assessment of internal consistency within constructs, the composite reliability (CR) was computed. The CRs exceeded the acceptable threshold of 0.70 across all constructs. Hence, we retained all individual items even those with factor loadings of <0.5 (Table 2).

The recommended threshold for average variance extracted (AVE) is 0.50, and there are six constructs not

Table 2. Measurement Model Evaluation for the Proposed Theoretical Model

Constructs	Items	Factor Loadings	CR	AVE
Government policy (GP)	1. The government influences the demand for telemedicine in my local health unit.	0.8990	0.7888	0.5621
	2. The government influences the supply of telemedicine in my local health unit.	0.7360		
	3. Government policies specifically create awareness and promotion of the use of telemedicine.	0.5800		
External suppliers' capacity (ESC)	4. There is sufficient technical support for telemedicine maintenance in my local health unit.	0.9110	0.8546	0.6685
	5. There is sufficient technical support for telemedicine development in my local health unit.	0.8950		
	6. Our staff and I received adequate telemedicine training in my local health unit.	0.6120		
Project team's capacity (PTC)	7. In my local health unit, there is a formal and qualified project team for telemedicine.	0.7930	0.8449	0.5773
	8. Staff responsibilities in the telemedicine program in my local health unit are formally established.	0.7220		
	9. The telemedicine project team can understand the medical needs of the different departments in my local health unit.	0.7150		
	10. The project team has a capable information system for the development of telemedicine.	0.8050		
Top management support (TMS)	11. The senior management (e.g., Mayor or local government unit or LGU) in my local health unit is a key factor in the telemedicine program.	0.2970	0.7476	0.4585
	12. In my local health unit, the use of telemedicine is supported by top management (e.g., Mayor or LGU).	0.5290		
	13. The ability of the top management to take the risk involved in the adoption of telemedicine is important.	0.9210		
	14. The commitment of the top management (e.g., Mayor or LGU) to provide adequate financial and other resources for the development and operation of telemedicine is important.	0.7860		
Perceived usefulness (PU)	15. Using telemedicine in my job could improve the care I give to my patients.	0.7320	0.8962	0.6342
	16. Using telemedicine in my job would increase my efficiency as a physician.	0.8530		
	17. Using telemedicine will make it easier to do my job.	0.7400		
	18. Using telemedicine would help improve the performance of my job.	0.8340		
	19. Using telemedicine in my job would increase my productivity.	0.8150		
Perceived ease of use (EU)	20. Operating the computer to use telemedicine would be easy for me.	0.6590	0.7870	0.4934
	21. Learning to operate telemedicine would be easy for me.	0.9480		
	22. I find telemedicine to be easy to use.	0.6040		
	23. My interaction with the telemedicine system is clear and understandable.	0.5250		
Attitude (A)	24. I am not in favor of telemedicine as it lacks the face-to-face interaction between patients and doctors.	0.6720	0.7505	0.4299
	25. I am not in favor of telemedicine as it is complex for users and providers.	0.6070		
	26. I am in favor of telemedicine since it is beneficial to my patient care and management.	0.6400		
	27. I am in favor of telemedicine as it is fully integrated in providing patient care.	0.7000		
Self-efficiency (SE)	28. I had seen someone else using telemedicine before trying it myself.	0.4760	0.7270	0.3852
	29. I could call someone for help if I got stuck.	0.2620		
	30. Someone else helped me get started with telemedicine.	0.5630		
	31. Someone showed me how to do telemedicine first.	1.0000		
	32. I was given a lot of time to complete my job using telemedicine	0.5600		
Acceptance of telemedicine (TA)	33. I would use telemedicine if my local health unit implemented this technology.	0.6180	0.7472	0.3858
	34. I would increase my use of telemedicine technology in future.	0.7400		
	35. I would recommend others to use telemedicine.	0.6950		
	36. I would use telemedicine because of the significance and prevalence of the problems to be addressed in my local health unit.	0.6470		
	37. I would use telemedicine because telemedicine in my local health unit is fully integrated in providing patient care.	0.3130		
Organizational culture (OC)	38. Meaningful incentives that reward technology progress are in place.	0.6600	0.7431	0.4208
	39. We are provided with adequate training on telemedicine.	0.6910		
	40. Work area management encourages us to apply continuous improvements in knowledge and skills of telemedicine.	0.5760		
	41. The organization's senior managers are actively leading the deployment of telemedicine.	0.6620		

CR – Composite Reliability, AVE – Average Variance Extracted

Table 3. Discriminant Validity Coefficients

	GP	ESC	PTC	TM	PU	EU	A	SE	TA	OC
GP	0.7497									
ESC	0.0534	0.8176								
PTC	0.2673	0.5824	0.7598							
TM	0.1003	0.0004	0.0562	0.6771						
PU	0.0919	0.0210	0.0476	0.0330	0.7963					
EU	-0.0657	0.0269	-0.0276	0.0478	0.0498	0.7024				
A	-0.0802	-0.0172	-0.0499	0.1279	-0.4054	-0.0270	0.6557			
SE	-0.0358	0.1237	-0.0168	-0.0338	-0.0183	-0.0158	0.0230	0.6206		
TA	0.0037	-0.0129	0.0048	0.0457	0.3107	0.1619	-0.3932	0.0398	0.6211	
OC	0.0273	0.4849	0.4879	-0.0050	0.0270	-0.1081	0.0239	0.2561	0.0989	0.6487

GP – Government policy, ESC – External suppliers' capacity, PTC – Project team's capacity, TM – Top management support, PU – Perceived usefulness, EU – Ease of use, A – Attitude, SE – Self-efficacy, TA – Telemedicine acceptance, OC – Organizational culture

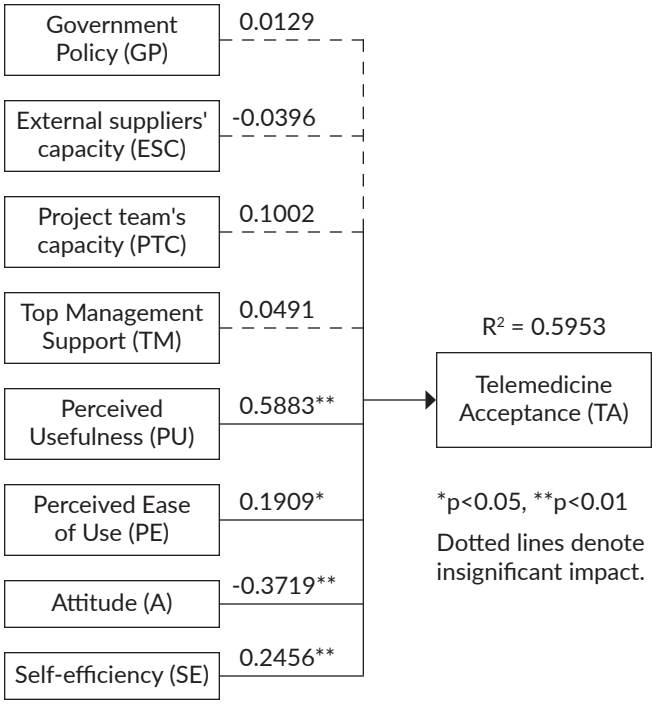

Figure 2. Path analysis.

meeting the minimum threshold (Table 2). However, according to Fornell and Larcker[18], convergent validity of the constructs is still considered adequate if their CR is higher than 0.60, which is the case for those six constructs (Table 2).

Discriminant validity was assessed using the method suggested by Fornell and Larcker.[14] The square root of the AVE should be greater than any of the correlations between two constructs (Table 3).

Considering all evaluations performed on the model which satisfied internal consistency, and convergent and discriminant validity, it may proceed to structural equation modeling using path analysis (Figure 2). The Partial Least Squares Structural Equation Modeling (PLS-SEM) revealed that 59.53% of the variability observed in the acceptance of telemedicine can be explained by the model. The results also showed that perceived usefulness (β=0.5883, p<0.01), perceived ease of use (β=0.1909, p<0.05), attitude (β=-0.3719, p<0.01), and self-efficiency (β=0.2456, p<0.01) have a significant effect on the acceptance of telemedicine (Figure 2).

The product indicator approach as described by Hair et al.[15] was performed by multiplying each of the product indicators of the constructs. The product indicators computed were included in the model as an interaction term, and the path coefficient was computed. Based on the results, both attitude (β=0.5849, p<0.01) and self-efficiency (β=0.5327, p<0.01) together with organizational culture demonstrated a positive significant impact on the acceptance of telemedicine (Table 4).

Table 4. Moderating Effects of Organizational Culture

Relationship	Path Coefficient	Std. Error	*p*-value	Decision
GP * OC → TA	-0.3529	0.2082	0.0901	Not supported
ESC * OC → TA	0.1102	0.3371	0.7436	Not supported
PTC * OC → TA	-0.4156	0.2175	0.0561	Not supported
TM * OC → TA	-0.0796	0.2530	0.7530	Not supported
PU * OC → TA	-0.2333	0.3222	0.4690	Not supported
EU * OC → TA	-0.2785	0.1994	0.1625	Not supported
A * OC → TA	0.5849	0.1517	0.0001**	Supported
SE * OC → TA	0.5327	0.1358	0.0001**	Supported

**p<0.05; **p<0.01 (one-tailed)*

GP – Government policy, ESC – External suppliers' capacity, PTC – Project team's capacity, TM – Top management support, PU – Perceived usefulness, EU – Ease of use, A – Attitude, SE – Self-efficacy, TA – Telemedicine acceptance, OC – Organizational culture

DISCUSSION

This study aimed to establish the determinants of telemedicine acceptance among the DTTBs in the Philippines from 2021 to 2022. The different factors measured were government policy, external suppliers' capacity, project team's capacity, top management support, perceived usefulness, perceived ease of use, attitude, self-efficacy, acceptance of telemedicine, and organizational culture. Among these factors, attitude (β=0.5849, $p<0.01$) and self-efficiency (β=0.5327, $p<0.01$) together with organizational culture were found to have a significant positive impact on telemedicine acceptance, while the rest did not.

With a study response rate of 64.44%, the DTTBs generally had a positive attitude towards the use of telemedicine as the majority found it simple to use (51.72%), beneficial to their patient care (59.49%), and fully integrated in providing patient care (48.28%). Despite not having a formal training on telemedicine and government-funded telemedicine programs or applications, the DTTBs demonstrated openness to its use especially in recent years wherein the pandemic severely limited in-person interactions with patients.

Similar studies in developing countries like Africa showed that doctors who had high perceived ease of use and perceived usefulness of telemedicine were found to have greater user satisfaction than those who did not.[16] Our study, however, did not show these two factors (perceived usefulness and perceived ease of use) to be significant determinants of telemedicine acceptance, which could be due to the lack of technology (e.g., mobile applications) available in the country at the moment catering specifically to telemedicine.

The majority of the respondents disagreed with all the statements related to their respective organizational cultures (Appendix B). Many DTTBs did not feel adequately supported in terms of telemedicine adoption, training, and further knowledge and skills development. A meta-analysis on the barriers, progress, and policies of telemedicine in the middle east showed that developing countries (Palestine, Yemen, Jordan, Syria, Egypt, Iraq, and Iran) found organizational culture to be a significant barrier to the advancement of telemedicine.[17] This is aggravated by the lack of relevant government policies and various human, organizational, and technological challenges.[18] Nonetheless, the DTTBs generally remained willing to use telemedicine being aware of its potential manifold benefits. Through telemedicine, they could reach more patients and provide appropriate healthcare services. Telemedicine could also ensure the safety of the DTTBs when faced by similar circumstances such as the COVID-19 contagion and help reduce the risk of accidents or untoward incidents from long, arduous travels to attend to patients in the mountains or across seas.

The results of this study suggest the need to improve the culture of organizations in our country particularly at the local government level towards telemedicine. It seems that efforts currently remain suboptimal for telemedicine to flourish in remote areas where they appear to be needed most. Future projects could promote educational interventions and infrastructure development in support of telemedicine.

Such efforts would not only benefit the DTTBs, but also the patients and our healthcare system in general. Collaborations among healthcare providers, local governments, and the Department of Health would be necessary in order to optimize the use of telemedicine especially in far-flung areas. The government can leverage the positive attitudes and self-efficiency of the DTTBs towards telemedicine.

Our study findings, however, were limited to the subjective perceptions of just one group of stakeholders. The subjective views could have been further investigated and explored thoroughly through qualitative methods, such as focus group discussions and one-on-one interviews. The points-of-view of other stakeholders (e.g., LGU officials, barangay health workers, patients and their families) could also be investigated in future studies. Nevertheless, the findings of our study provide baseline data that can be used for future research endeavors and projects related to telemedicine especially in geographically isolated and disadvantaged areas (GIDA).

CONCLUSION

Attitude and self-efficiency along with organizational culture are significant determinants of telemedicine acceptance among the doctors-to-the-barrios in the Philippines. This study shows a glimpse of telemedicine acceptance in the provinces and highlights the lack of support that DTTBs receive from the government in terms of funding and promotion of telemedicine efforts despite its potential manifold benefits, such as increasing healthcare access to patients in remote areas.

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Statement of Authorship

All authors certified fulfillment of ICMJE authorship criteria.

Author Disclosure

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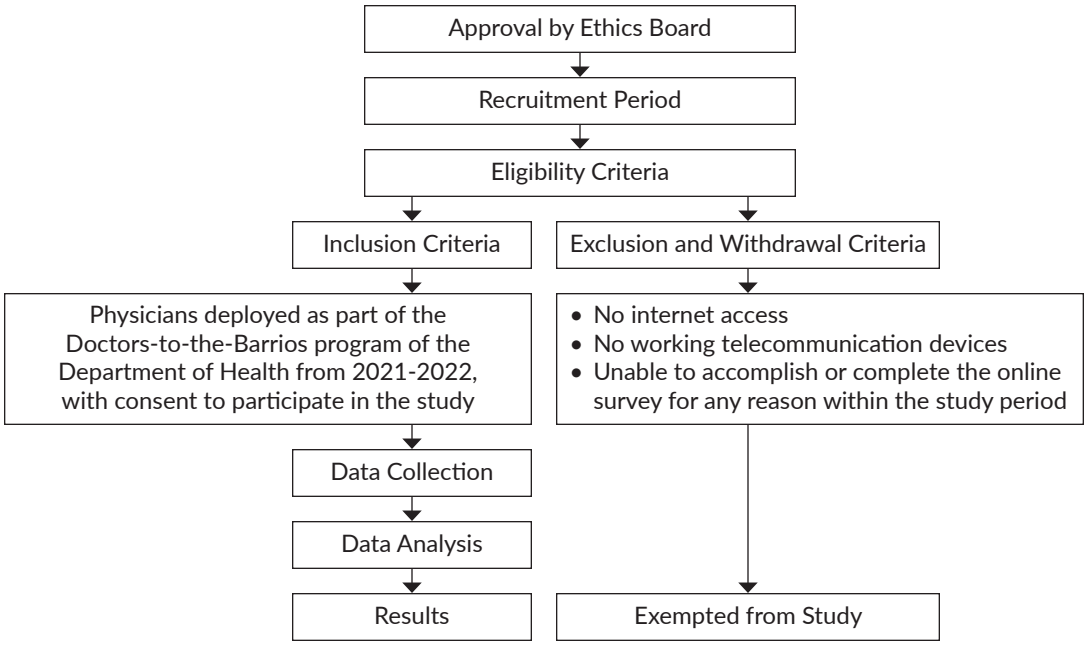
APPENDICES



Appendix A. Flow diagram of the study.

Appendix B. Survey results (n = 116)

	5 – Strongly agree	4 – Agree	3 – Neither Agree nor Disagree	2 – Disagree	1 – Strongly disagree
	Frequency (%)				
Government policies on telemedicine (GP)					
1. The government influences the demand for telemedicine in my local health unit.	18 (15.52%)	29 (25%)	30 (25.86%)	29 (25%)	10 (8.62%)
2. The government influences the supply of telemedicine in my local health unit.	28 (24.14%)	24 (20.69%)	18 (15.52%)	34 (29.31%)	12 (10.34%)
3. Government's policies specifically create awareness and promotion of the use of telemedicine.	16 (13.79%)	12 (10.34%)	27 (23.28%)	43 (37.07%)	18 (15.52%)
External suppliers' capacity (ESC)					
4. There is sufficient technical support for telemedicine maintenance in my local health unit.	1 (0.86%)	11 (9.48%)	25 (21.55%)	35 (30.17%)	44 (37.93%)
5. There is sufficient technical support for telemedicine development in my local health unit.	2 (1.72%)	11 (9.48%)	19 (16.38%)	42 (36.21%)	42 (36.21%)
6. Our staff and I received adequate telemedicine training in my local health unit.	1 (0.86%)	4 (3.45%)	12 (10.34%)	40 (34.48%)	59 (50.86%)
Project team's capacity (PTC)					
7. In my local health unit, there is a formal and qualified project team for telemedicine.	1 (0.86%)	7 (6.03%)	18 (15.52%)	27 (23.28%)	63 (54.31%)
8. Staff responsibilities in the telemedicine program in my local health unit are formally established.	0 (0%)	3 (2.59%)	11 (9.48%)	34 (29.31%)	68 (58.62%)
9. The telemedicine project team can understand the medical needs of the different departments in my local health unit.	0 (0%)	12 (10.34%)	23 (19.83%)	32 (27.59%)	49 (42.24%)
10. The project team has a capable information system for the development of telemedicine.	1 (0.86%)	3 (2.59%)	19 (16.38%)	38 (32.76%)	55 (47.41%)
Top management support (TM)					
11. The senior management (e.g., Mayor or LGU) in my local health unit is a key factor in the telemedicine program.	24 (20.69%)	38 (32.76%)	12 (10.34%)	22 (18.97%)	20 (17.24%)
12. In my local health unit, the use of telemedicine is supported by top management (e.g., Mayor or LGU).	5 (4.31%)	17 (14.66%)	32 (27.59%)	34 (29.31%)	28 (24.14%)
13. The ability of the top management to take the risk involved in the adoption of telemedicine is important.	52 (44.83%)	29 (25%)	12 (10.34%)	13 (11.21%)	10 (8.62%)
14. The commitment of the top management (e.g., Mayor or LGU) to provide adequate financial and other resources for the development and operation of telemedicine is important.	65 (56.03%)	20 (17.24%)	14 (12.07%)	9 (7.76%)	8 (6.9%)
Perceived usefulness (PU)					
15. Using telemedicine in my job could improve the care I give to my patients.	41 (35.34%)	47 (40.52%)	23 (19.83%)	4 (3.45%)	1 (0.86%)
16. Using telemedicine in my job would increase my efficiency as a physician.	42 (36.21%)	43 (37.07%)	26 (22.41%)	4 (3.45%)	1 (0.86%)
17. Using telemedicine will make it easier to do my job.	27 (23.28%)	41 (35.34%)	30 (25.86%)	16 (13.79%)	2 (1.72%)
18. Using telemedicine would help improve the performance of my job.	28 (24.14%)	41 (35.34%)	34 (29.31%)	12 (10.34%)	1 (0.86%)
19. Using telemedicine in my job would increase my productivity.	35 (30.17%)	40 (34.48%)	33 (28.45%)	7 (6.03%)	1 (0.86%)
Perceived ease of use (EU)					
20. Operating the computer to use telemedicine would be easy for me.	58 (50%)	44 (37.93%)	11 (9.48%)	3 (2.59%)	0 (0%)
21. Learning to operate telemedicine would be easy for me.	56 (48.28%)	49 (42.24%)	7 (6.03%)	4 (3.45%)	0 (0%)
22. I find telemedicine to be easy to use.	37 (31.9%)	53 (45.69%)	21 (18.1%)	5 (4.31%)	0 (0%)
23. My interaction with the telemedicine system is clear and understandable.	24 (20.69%)	43 (37.07%)	43 (37.07%)	4 (3.45%)	2 (1.72%)

Appendix B. Survey results (n = 116) *(continued)*

	5 – Strongly agree	4 – Agree	3 – Neither Agree nor Disagree	2 – Disagree	1 – Strongly disagree
	Frequency (%)				
Attitudes towards telemedicine (A)					
24. I am not in favor of telemedicine as it lacks the face-to-face interaction between patients and doctors.	7 (6.03%)	25 (21.55%)	42 (36.21%)	33 (28.45%)	9 (7.76%)
25. I am not in favor of telemedicine as it is complex for users and providers.	7 (6.03%)	13 (11.21%)	36 (31.03%)	41 (35.34%)	19 (16.38%)
26. I am in favor of telemedicine since it is beneficial to my patient care and management.	18 (15.52%)	51 (43.97%)	37 (31.9%)	9 (7.76%)	1 (0.86%)
27. I am in favor of telemedicine as it is fully integrated in providing patient care.	18 (15.52%)	38 (32.76%)	41 (35.34%)	16 (13.79%)	3 (2.59%)
Self-efficiency (SE) domain on telemedicine					
28. I had seen someone else using telemedicine before trying it myself.	28 (24.14%)	36 (31.03%)	21 (18.1%)	21 (18.1%)	10 (8.62%)
29. I could call someone for help if I got stuck.	21 (18.1%)	44 (37.93%)	25 (21.55%)	18 (15.52%)	8 (6.9%)
30. Someone else helped me get started with telemedicine.	9 (7.76%)	22 (18.97%)	34 (29.31%)	31 (26.72%)	20 (17.24%)
31. Someone showed me how to do telemedicine first.	7 (6.03%)	22 (18.97%)	32 (27.59%)	33 (28.45%)	22 (18.97%)
32. I was given a lot of time to complete my job using telemedicine.	6 (5.17%)	18 (15.52%)	32 (27.59%)	39 (33.62%)	21 (18.1%)
Acceptance of telemedicine (TA)					
33. I would use telemedicine if my local health unit implemented this technology.	53 (45.69%)	46 (39.66%)	11 (9.48%)	5 (4.31%)	1 (0.86%)
34. I would increase my use of telemedicine technology in future.	43 (37.07%)	42 (36.21%)	24 (20.69%)	5 (4.31%)	2 (1.72%)
35. I would recommend others to use telemedicine.	44 (37.93%)	37 (31.9%)	30 (25.86%)	5 (4.31%)	0 (0%)
36. I would use telemedicine because of the significance and prevalence of the problems to be addressed in my local health unit.	32 (27.59%)	45 (38.79%)	26 (22.41%)	11 (9.48%)	2 (1.72%)
37. I would use telemedicine because telemedicine in my local health unit is fully integrated in providing patient care.	15 (12.93%)	22 (18.97%)	33 (28.45%)	28 (24.14%)	18 (15.52%)
Organizational culture (OC) towards telemedicine					
38. Meaningful incentives that reward technology progress are in place.	8 (6.9%)	9 (7.76%)	32 (27.59%)	37 (31.9%)	30 (25.86%)
39. We are provided with adequate training on telemedicine.	3 (2.59%)	5 (4.31%)	14 (12.07%)	40 (34.48%)	54 (46.55%)
40. Work area management encourages us to apply continuous improvements in knowledge and skills of telemedicine.	4 (3.45%)	26 (22.41%)	21 (18.1%)	32 (27.59%)	33 (28.45%)
41. The organizational senior managers are actively leading the deployment of telemedicine.	4 (3.45%)	11 (9.48%)	25 (21.55%)	29 (25%)	47 (40.52%)