ASSESSMENT OF MEDICAL DOCTOR'S KNOWLEDGE, PERCEPTION, AND WILLINGNESS TOWARD TELEMEDICINE IN THREE SILOAM HOSPITALS IN BALI ISLAND

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ABSTRACT

This study assesses the knowledge, perception, and willingness of medical doctors toward telemedicine at three prominent hospitals in Bali: Siloam Hospitals Denpasar, Bali International Medical Centre Kuta, and Bali International Medical Center Nusa Dua. The research involved a cross-sectional quantitative approach using a questionnaire distributed to 40 participating general practitioners and specialists. Key findings revealed that while most doctors are familiar with telemedicine, there remains a variance in their perception and willingness to adopt it, largely influenced by demographic factors such as age, gender, and practice type. Despite the ongoing growth of telemedicine, the study highlights the need for targeted training and awareness programs to ensure its effective integration into healthcare services.

| KEYWORDS | *Telemedicine, Medical doctors, Perception, Willingness* |

INTRODUCTION

Throughout history, healthcare services has been traditionally provided on charity-based as the famous parable of "a Good Samaritan" or in many accounts its evolvement is part of raging war such as the evolution of nursing care by a British nurse, Florence Nightingale during World War 1 and how American military employed huge number of healthcare providers in supporting the victory of the Allies in World War 2 (Silva, R. N. D., & Ferreira, M. D. A. (2021).

As the world recovered from Post War eras, healthcare services have evidently evolved from a mainly non-profit activities to be a large business field. In the US, Healthcare sector employs the largest proportion of their market workforce, accumulating to around 20.5 million employees across the country (United States Census Bureau, 2020). Indonesia, on the other hand, as the fourth largest country in the world by population, has implemented the Universal Health Coverage (UHC) since 2014 which marked a significant health expenditure. By 2030, it is projected that 99% of Indonesian will have national health insurance both through out-of-pocket, employer or government subsidized coverages (Kementerian Kesehatan, 2021).

Before the pandemic of COVID-19 hit Indonesia in 2020, Indonesia has seen a rapid increase in healthcare business sector innovation particularly in the telemedicine industry. Telemedicine has brought a fresh air to the end users, which are the consumers to enjoy healthcare services without having to spend time visiting a physical office of mainly doctors either in clinic or out-patient hospitals setting. Conversely, health industries, mainly start-up companies have taken this opportunity to expand their business by collaborating with other stakeholders to provide seamless and hazzle-free services to end users. The Ministry of Health of Indonesia currently approve 6 telemedicine providers to be their official partners (Arlinta, 2024).

On the other hand, the world of business also is evolving. For instance, in a study conducted by Suleman, D., Ali, H., Nusraningrum, D., & Ali, M. M. (2020) found that there is a growing tendency of online shopping vs offline shopping in the current world. Furthermore, Suleman, D., Ali, H., Nusraningrum, D., & Ali, M. M. (2020) in the article "Consumer behaviour in the marketing 4.0 era regarding decisions about where to shop" revealed that retail attitude and decisions in positively influenced by risk. Moreover, Dzulfikar, A., Jahroh, S., & Ali, M. M. (2022) emphasized that there is a need for innovation of business development strategy when it comes to worldwide health crisis such as COVID-19.

Business must be sustainable in order to survive and flourish in the future. In a study conducted by Gunawan, F., Ali, M. M., & Nugroho, A. (2019) found that purchase decision is positively affected by consumer attitude. Moreover, Ali, M. M., & Suciana, A. (2019), argued that three main variables affected purchase decision which are location, price, and service quality.

As the business of telemedicine keeps evolving, it is important to note that, medical doctors, as the main stakeholder in the current telemedicine business need to have an adequate knowledge, a proper perception, and the willingness to utilize telemedicine as it is not only seen as a way of healthcare service but more importantly it is a new channel of healthcare business in this rapidly changing world.

A study on medical doctor's knowledge, perception, and willingness toward telemedicine has been conducted in four different hospitals in Saudi Arabia (Albarrak, A. I., Mohammed, R., Almarshoud, N., Almujalli, L., Aljaeed, R., Altuwaijiri, S., & Albohairy, T., 2021). However, due to the difference of nuances between Indonesia and Saudi Arabia, particularly, in the Bali island which arguably the most touristic

destination in Indonesia, the study deserved to be conducted by acknowledging the uniqueness of healthcare services delivered in the island of Bali.

This study focuses on assessing the knowledge, perception, and willingness of doctors to utilize telemedicine as an integral part of healthcare services. The research was conducted at three renowned hospitals in Bali: Siloam Hospitals Denpasar (SHDP), Bali International Medical Centre Kuta (BIMC Kuta), and Bali International Medical Center Nusa Dua (BIMC ND). It involved general practitioners and specialists who were willing to participate. The research addresses current knowledge assessment, perception towards telemedicine, willingness to use telemedicine, correlations between knowledge, perception, and willingness, as well as the role of demographic information. The aim of the study is to address these issues and evaluate the level of knowledge, perception, and willingness of doctors to use telemedicine. The theoretical benefit lies in providing a systematic analysis of doctors' responses to telemedicine, while the practical benefit is to provide guidance for doctors to enhance their knowledge, foster appropriate perceptions, and be willing to utilize telemedicine as a revenue-generating source.

The various studies focus on the knowledge, perception, and willingness towards telemedicine across different settings and professions, including medical doctors, nurses, and medical students. The studies, conducted using questionnaires, revealed diverse findings but consistently highlighted the need for continuous training. For instance, Albarrak et al. (2021) found average telemedicine knowledge among physicians in Riyadh, with a significant number advocating for essential training. Malhotra et al. (2020) reported insufficient telemedicine knowledge among students in private institutions. Ahmed et al. (2021) noted that less than half of the health professionals in a low-income country were willing to use telemedicine during COVID-19. Tjiptoatmadja and Alfian (2022) discovered a positive perception of telepharmacy among Indonesians. Meanwhile, Ahmed et al. (2021) observed that young nursing staff at King Abdul-Aziz University Hospital had better knowledge and attitudes towards telemedicine compared to their senior counterparts. A systematic review by Ghaddaripouri et al. (2023) found medical students generally positive about telemedicine. Studies from Malaysia, Libya, Pakistan, India, and China all indicated varying degrees of awareness, knowledge, and usage of telemedicine, underscoring the need for improved training and awareness to optimize telemedicine's potential in healthcare.

Hypothesis

As the preliminary assumption of this research of the current phenomenon based on the problem statements, the proposed proposition are as follows:
1. There is good level of knowledge among medical doctors at SHG in Bali
2. Some of the medical doctors are still skeptical on how they perceive telemedicine

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3. The willingness of using telemedicine is somewhat varies from one medical doctor to another given the fact that there is a variety in the demographic data of the doctors.

RESEARCH METHOD

This research of the "Assessment of Medical Doctor's Knowledge, Perception, and Willingness toward Telemedicine in Three Hospitals in Bali", has been completed in June 2024. This is a cross-sectional quantitative study. Quantitative study aims to focus on collecting numerical data and attempt to generalize it across various group of people in order to explain a phenomenon (University of Southern California, 2024). Cross sectional studies survey is defined as a study that is taken at one point of time. This study measures the knowledge, perception, and willingness toward telemedicine among medical doctors at SHG in Bali. This research used an existing questionnaire developed by previous research that consists of Demographic information, Access to Internet, Knowledge, Perception, and Willingness toward telemedicine. SPSS is used to analyze the results of this research.

The population of this research are all medical doctors at SHDP, BIMC ND, BIMC Kt who were willing to give the consent to participate in this research. The instrument of this research is an existing questionnaire in which its validity and reliability has been previously tested. As the instrument is adopted from a well validated and reliable questionnaire, hence a second validity and reliability test was unnecessary (Korb, 2012).

The data was collected through "Google Form" and the result was available in the google sheet. The participants would be asked to fill out their consent one the first page of the questionnaire, then they could continue to fill out the rest of questionnaire. The data was analyzed using a computer statistical package. The data was be then processed through univariate, bivariate, and multivariate methods. If the expected data is less than five, Fisher's Exact Test was used, otherwise Chi-Square test was used. In analyzing the normality of the data, Kolmorgrov Smirnov test was used.

To analyze the factors related to scores of knowledge, perception, willingness toward telemedicine, independent-sample Kruskal wallis test was used, otherwise the statistical analysis used U Mann-Whitney test as U Mann-Whitney can only be used for two or less categories. In addition, multivariate linear regression was used to perform the analysis of dependent factors such as practice type, gender, and age range against dependent factors, knowledge, perception and willingness

The limitation of this research is related to the use of questionnaire as the single way to assess knowledge, perception, and willingness toward telemedicine which limits the doctor's ability to fully express their thoughts on the given themes. Another limitation of this research is that the number of the respondents that will participate in this research. A larger number of respondents would provide a better way of generalization of this research on a larger scale.

RESULT AND DISCUSSION

Research Result

The data collection was conducted in June 2024 involving the population of medical doctors at Siloam Hospitals Denpasar, BIMC Kuta, and BIMC Nusa Dua who volunteered to participate in the research. The questionnaire was given through online form, thus giving the participants easy access to fill out the questionnaire. From the given time frame, 4 – 7 June 2024, 40 medical doctors filled out the questionnaire voluntarily by providing their consent in the online questionnaire. The basic demographic information of the participants is shown in table 4.1

Table 4.1. Characteristics of survey participants

No.	Characteristics	n (N=40)	% from N
1	Type of practice		
	General practitioner (GP)	17	42.5
	Specialist / consultant	23	57.5
2	Gender		
	Male	21	52.5
	Female	19	47.5
3	Number of practice facilities		
	1 healthcare facility	33	82.5
	2 healthcare facilities	5	12.5
	3 healthcare facilities	2	5.0
4	Age range		
	Below 31 years old	8	20.0
	Between 31-40 years old	21	52.5
	Between 41-50 years old*	8	20.0
	Between 51-60 years old*	1	2.5
	Above 60 years old*	2	5.0

*in later analysis, these age groups were combined as above 40 years old

From table 4.1 it can be concluded that specialists and consultants had a slightly higher participations. Both genders were almost equally represented in this study. Most participants work in more than one hospitals as the government of Indonesia allows medical doctor to practice in up to three different hospitals. Around half of the participants are in the age range of 31 – 40 years old which mostly represented by general practitioners.

The three hospitals in Bali were chosen because their unique characteristics, as they serve a large number of international patients from around the world as Bali is the most visited tourism island in Indonesia. The medical doctors are supposedly more

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familiar with international practice of healthcare as they often correspond with medical doctors abroad for case monitoring of tourist visiting Bali.

Factors Related to Computer Access and Literacy by Practice Type, Gender, and Age

The factors related to computer access and literacy was analyzed to get the basic insight of the participants' day to day use of the Internet and their thought about it. As shown in table 4.2 the results varied from one question to another. Most participants across practice type, gender, and age range use PC or laptop at home   sometimes or rarely as they might spend their time using computer in the hospitals. In terms of search information online, most participants always do that on daily basis. Interaction with patients via online is not a common practice yet, as the healthcare services are mostly done through offline Out-Patient or In-Patient settings.   The research revealed that male doctors have   low tendency in contacting the patient through online platform. In regards to obtaining information to be given to patients, the younger the age   of the doctors, the higher the   chance to find online information. In addition,   the research also found that GPs do more literature search compared to specialists/consultants.

Factors related to knowledge toward telemedicine by practice type, gender, and age

As shown in Table 4.3, it was revealed that specialists/consultants have higher score in attending conferences or meeting related to telemedicine in their respective hospitals. This finding might align with the following finding in which GPs seem to have less familiarity with telemedicine guideline

Factors related to perception toward telemedicine by practice type, gender, and age

Table 4.4 showed that there is no statistical significance toward telemedicine among the participants by practice type, gender, and age.

Factors related to willingness toward telemedicine by practice type, gender, and age

Similar to perception toward telemedicine, there seems to be no significant difference among medical doctors by their practice type, gender, and age.

Scores of Knowledge, Perception, and Willingness toward Telemedicine

Using the Kolmogrov-Smirnov Test to test the normality of each variable, it showed that all variables showed non-normal distribution as the P-value < 0.05.

Factors related to scores of knowledge, perception, willingness toward telemedicine

Due to the non-normal distribution of the data, t-test can't be used to find the difference between the three variables. Thus, Kruskall Wallis test is used for category more than two and U-Mann Whitney test is used for category less than or equal to two. Table 4.5 proved that there is no significant difference in terms of practice type, gender, age range, in knowledge variable. On the other hand, perception variable has a significant difference in terms of gender, while willingness variable has a significant difference when it comes to practice type and gender. This showed that some participants consistently answered with low score while others answered with high scores, so when it was accumulated, the scores showed some differences compared to individual question.

Multivariate test on factors related to scores of knowledge, perception, willingness toward telemedicine

The multivariate analysis of dependent factors such as practice type, gender, and age range against dependent factors, knowledge, perception and willingness separately do not have a significant relation.

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Table 4.2. Factors related to computer access and literacy by practice type, gender, and age

Questions	Levels	Total (N=40) n (%)	Practice type n (%)			Gender n (%)			Age range n (%)			
			GP (N=17)	Specialist (N=23)	p-value	Female (N=19)	Male (N=21)	p-value	< 31 yo (N=8)	31-40 yo (N=21)	> 40 yo (N=11)	p-value
1. How often do you use PC/Laptop at home?	1) Never	2 (5.0)	1 (5.9)	1 (4.3)		2 (10.5)	0 (0.0)		0 (0.0)	0 (0.0)	2 (18.2)	
	2) Sometimes or rarely	24 (60.0)	10 (58.8)	14 (60.9)	0.974	10 (52.6)	14 (66.7)	0.276	4 (50.0)	12 (57.1)	8 (72.7)	0.068
	3) Always or often	14 (35.0)	6 (35.3)	14 (35.0)		7 (36.8)	7 (33.3)		4 (50.0)	9 (42.9)	1 (9.1)	
2. How often do you search for information online?	1) Never	0 (0.0)	0 (0.0)	0 (0.0)		0 (0.0)	0 (0.0)		0 (0.0)	0 (0.0)	0 (0.0)	
	2) Sometimes or rarely	5 (12.5)	2 (11.8)	3 (13.0)	0.646*	4 (21.1)	1 (4.8)	0.141*	1 (12.5)	2 (9.5)	2 (18.2)	0.781
	3) Always or often	35 (87.5)	15 (88.2)	20 (87.0)		15 (78.9)	20 (95.2)		8 (87.5)	19 (90.5)	9 (81.8)	
3. How often do you shop online?	1) Never	0 (0.0)	0 (0.0)	0 (0.0)		0 (0.0)	0 (0.0)		0 (0.0)	0 (0.0)	0 (0.0)	
	2) Sometimes or rarely	25 (62.5)	11 (64.7)	14 (60.9)	0.804	10 (52.6)	25 (71.4)	0.220	4 (50.0)	13 (61.9)	8 (72.7)	0.598
	3) Always or often	35 (87.5)	6 (35.3)	9 (39.1)		9 (47.4)	6 (28.6)		4 (50.0)	8 (38.1)	3 (27.3)	
4. In your role as a doctor, how often do you interact with patients via e-mail or through social media?	1) Never	4 (10.0)	1 (5.9)	3 (13.0)		0 (0.0)	4 (19.0)		0 (0.0)	2 (9.5)	2 (18.2)	
	2) Sometimes or rarely	20 (50.0)	8 (47.1)	12 (52.2)	0.631	13 (68.4)	7 (33.3)	0.035	5 (62.5)	9 (42.9)	6 (54.5)	0.589
	3) Always or often	16 (40.0)	8 (47.1)	8 (34.8)		6 (31.6)	10 (47.6)		3 (37.5)	10 (47.6)	3 (27.3)	
5. How many smart devices do you have?	1) 1 device	8 (20.0)	0 (0.0)	8 (34.8)		3 (15.8)	5 (23.8)		0 (0.0)	5 (23.8)	3 (27.3)	
	2) 2 devices	18 (45.0)	9 (52.9)	9 (39.1)	0.023	11 (57.9)	7 (33.3)	0.296	5 (62.5)	7 (33.3)	6 (54.5)	0.317
	3) 3 or more devices	14 (35.0)	8 (47.1)	6 (26.1)		5 (26.3)	9 (42.9)		3 (37.5)	9 (42.9)	2 (18.2)	
6. Have been questioned by patients about online means of contacting you?	1) No	9 (22.5)	4 (23.5)	5 (21.7)	0.594*	4 (21.1)	5 (23.8)	0.569*	1 (12.5)	6 (28.6)	2 (18.2)	0.600
	2) Yes	31 (77.5)	13 (76.5)	18 (78.3)		15 (78.9)	16 (76.2)		7 (87.5)	15 (71.4)	9 (81.8)	
7. Do you use social media/Internet for the following purposes? (select all that applies)	1) Obtaining information to give to patients	28 (70.0)	14 (82.4)	14 (60.9)	0.143	15 (78.9)	13 (61.9)	0.240	8 (100.0)	15 (71.4)	5 (45.5)	0.037
	2) Patient consultation	19 (47.5)	7 (41.2)	12 (52.2)	0.491	9 (47.4)	10 (47.6)	0.987	5 (62.5)	10 (47.6)	4 (36.4)	0.530
	3) Literature search	33 (82.5)	17 (100.0)	16 (69.6)	0.013*	17 (89.5)	16 (76.2)	0.248	8 (100.0)	17 (81.0)	8 (72.7)	0.292
	4) Maintain your knowledge and skills	35 (87.5)	16 (9.1)	19 (87.5)	0.280*	17 (89.5)	18 (85.7)	0.549*	8 (100.0)	19 (90.5)	8 (72.7)	0.173
	5) None of the previous options	2 (5.0)	1 (5.9)	1 (4.3)	0.676*	2 (!0.5)	0 (0.0)	0.219*	1 (!2.5)	0 (0.0)	1 (9.1)	0.295
8. Are you concerned of possi legal issues around interact with patient online?	1. No	5 (12.5)	2 (11.8)	3 (13.0)	0.646*	2 (10.5)	3 (14.3)	0.549*	1 (12.5)	3 (14.3)	1 (9.1)	0.915
	2. Yes	35 (87.5)	15 (88.2)	20 (87.0)		17 (89.5)	18 (85.7)		7 (87.5)	18 (85.7)	10 (90.9)	

* statistical analysis used Fisher's exact test, otherwise the statistical analysis used Chi-square test

Table 4.3. Factors related to knowledge toward telemedicine by practice type, gender, and age

Questions	Levels	Total (N=40) n (%)	Practice type n (%)			Gender n (%)			Age range n (%)			
			GP (N=17)	Specialist (N=23)	p-value	Female (N=19)	Male (N=21)	p-value	< 31 yo (N=8)	31-40 yo (N=21)	> 40 yo (N=11)	p-value
1. To what extent are you familiar with telemedicine technology?	1) Low	6 (15.0)	2 (11.8)	4 (17.4)	0.588	3 (15.9)	3 (14.3)	0.627	1 (!2.5)	3 (14.3)	2 (18.2)	0.902
	2) Average	33 (82.5)	15 (88.2)	18 (78.3)		16 (84.2)	17 (81.0)		7 (87.5)	17 (81.0)	9 (81.8)	
	3) High	1 (2.5)	0 (0.0)	1 (4.3)		0 (0.0)	1 (4.8)		0 (0.0)	1 (4.8)	0 (0.0)	
2. To what extent are you familiar with the medical applications of telemedicine technology?	1) Low	10 (25.0)	6 (35.3)	4 (17.4)	0.326	4 (21.1)	6 (28.6)	0.512	2 (25.0)	6 (28.6)	2 (18.2)	0.835
	2) Average	29 (72.5)	11 (64.7)	18 (78.3)		15 (78.9)	14 (66.7)		6 (75.0)	14 (66.7)	9 (81.8)	
	3) High	1 (2.5)	0 (0.0)	1 (4.3)		0 (0.0)	1 (4.8)		0 (0,0)	1 (4.8)	0 (0.0)	
3. How often conferences, speeches or meetings held in your workplace regarding telemedicine technology?	1) Low	16 (40.0)	11 (64.7)	5 (21.7)	0.015	8 (42.1)	8 (38.1)	0.718	5 (62.5)	7 (33.3)	4 (36.4)	0.335
	2) Average	21 (52.5)	6 (35.3)	15 (65.2)		9 (47.4)	12 (57.1)		3 (37.5)	13 (61.9)	4 (36.4)	
	3) High	3 (7.5)	0 (0.0)	3 (13.0)		2 (10.5)	1 (4.8)		0 (0.0)	1 (4.8)	2 (18.2)	
4 To what extent are you familiar with telemedicine tools?	1) Low	12 (30.0)	7 (41.2)	5 (21.7)	0.173	7 (36.8)	5 (23.8)	0.628	3 (37.5)	6 (28.6)	3 (27.3)	0.918
	2) Average	25 (62.5)	10 (58.8)	15 (65.2)		11 (57.9)	14 (66.7)		5 (62.5)	13 (61.9)	7 (63.6)	
	3) High	3 (7.5)	0 (0.0)	3 (!3.0)		1 (5.3)	2 (9.5)		0 (0.0)	2 (9.5)	1 (9.1)	
5. To what extent are you familiar with telemedicine guidelines	1) Low	19 (47.5)	12 (70.6)	7 (30.4)	0.031	10 (52.6)	9 (42.9)	0.808	5 (62.5)	10 (47.6)	4 (36.4)	0.787
	2) Average	19 (47.5)	4 (23.5)	15 (65.2)		8 (42.1)	11 (52.4)		3 (37.5)	10 (47.5)	6 (54.5)	
	3) High	2 (5.0)	1 (5.9)	1 (4.3)		1 (5.3)	1 (4.8)		0 (0.0)	1 (4.8)	1 (9.1)	
6. To what extent are you familiar with the use of telemedicine in other countries?	1) Low	18 (45.0)	10 (58.8)	8 (34.8)	0.257	9 (47.4)	9 (42.9)	0.514	4 (50.0)	10 (47.6)	4 (36.4)	0.572
	2) Average	21 (52.5)	7 (41.2)	14 (60.9)		9 (47.4)	12 (57.1)		4 (50.0)	11 (52.4)	6 (54.5)	
	3) High	1 (2.5)	0 (0.0)	1 (4.2)		1 (5.3)	0 (0.0)		0 (0.0)	0 (0.0)	1 (9.1)	
7. To what extent is continuous training in the use of telemedicine necessary for doctors?	1) Low	4 (50.0)	10 (47.6)	4 (36.4)	0.572	3 (15.8)	3 (14.3)	0.860	1 (12.5)	3 (!4.3)	2 (18.2)	0.975
	2) Average	4 (50.0)	11 (52.4)	6 (54.5)		12 (63.2)	12 (57.1)		5 (62.5)	12 (57.1)	7 (63.6)	
	3) High	0 (0.0)	0 (0.0)	1 (9.1)		4 (21.1)	6 (28.6)		2 (25.0)	6 (28.6)	2 (18.2)	

* statistical analysis used Fisher's exact test, otherwise the statistical analysis used Chi-square test

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Table 4.4 Factors related to perception toward telemedicine by practice type, gender, and age

Questions	Levels	Total (N=40) n (%)	Practice type n (%)			Gender n (%)			Age range n (%)			
			GP (N=17)	Specialist (N=23)	p-value	Female (N=19)	Male (N=21)	p-value	< 31 yo (N=8)	31-40 yo (N=21)	> 40 yo (N=11)	p-value
1. Telemedicine is a viable approach for providing medical care services to patients	1) Agree	31 (77.5)	12 (70.6)	19 (82.6)	0.301*	16 (84.2)	15 (71.4)	0.280*	5 (62.5)	17 (81.0)	9 (81.8)	0.524
	2) Disagree	9 (22.5)	5 (29.4)	4 (!7.4)		3 (15.8)	6 (28.6)		3 (37.5)	4 (19.0)	2 (18.2)	
2. There is a potential role for ICT in the health care	1) Agree	39 (97.5)	17 (100.0)	22 (95.7)	0.575*	19 (100.0)	20 (95.2)	0.525*	8 (100.0)	20 (95.2)	11 (100.0)	0.629
	2) Disagree	1 (2.5)	0 (0.0)	1 (4.3)		0 (0.0)	1 (4.8)		0 (0.0)	1 (4.8)	0 (0.0)	
3. Using of telemedicine system can save time and money	1) Agree	36 (90.0)	16 (94.1)	20 (87.0)	0.624*	18 (94.7)	18 (85.7)	0.607*	7 (87.5)	19 (90.5)	10 (90.9)	0.965
	2) Disagree	4 (10.0)	1 (5.9)	3 (13.0)		1 (5.3)	3 (!4.3)		1 (12.5)	2 (9.5)	1 (9.1)	
4. Telemedicine system can save efforts	1) Agree	37 (92.5)	16 (94.1)	21 (91.3)	0.615*	19 (100.0)	18 (85.7)	0.135*	8 (100.0)	19 (90.5)	10 (90.9)	0.666
	2) Disagree	3 (7.5)	1 (5.9)	2 (8.7)		0 (0.0)	3 (14.3)		0 (0.0)	2 (9.5)	1 (9.1)	
5. The applications of ICT in healthcare is already available	1) Agree	32 (80.0)	13 (76.5)	19 (82.6)	0.463*	18 (94.7)	14 (66.7)	0.031*	8 (100.0)	14 (66.7)	10 (90.9)	0.076
	2) Disagree	8 (20.0)	4 (23.5)	4 (17.4)		1 (5.3)	7 (33.3)		0 (0.0)	7 (33.3)	1 (9.1)	

* statistical analysis used Fisher's exact test, otherwise the statistical analysis used Chi-square test

Table 4.5. Factors related to willingness toward telemedicine by practice type, gender, and age

Questions	Levels	Total (N=40) n (%)	Practice type n (%)			Gender n (%)			Age range n (%)			
			GP (N=17)	Specialist (N=23)	p-value	Female (N=19)	Male (N=21)	p-value	< 31 yo (N=8)	31-40 yo (N=21)	> 40 yo (N=11)	p-value
1. I would like to consult with the large centers in my specialty, whilst I am in my own hospital.	1) Agree	39 (97.5)	16 (94.1)	23 (100)	0.425*	18 (94.7)	21 (100)	0.475*	8 (100.0)	21 (100)	10 (90.9)	0.259
	2) Disagree	1 (2.5)	1 (5.9)	0 (0.0)		1 (5.3)	0 (0.0)		0 (0.0)	0 (0.0)	1 (9.1)	
2. I would like to be able to watch a procedure as it is taking place	1) Agree	37 (92.5)	16 (94.1)	21 (91.3)	0.615*	18 (94.7)	19 (90.5)	0.538*	8 (100.0)	20 (95.2)	9 (81.8)	0.261
	2) Disagree	3 (7.5)	1 (5.9)	2 (8.7)		1 (5.3)	2 (9.5)		0 (0.0)	1 (4.8)	2 (18.2)	
3. The implantation of telemedicine technology is appropriate due to the current conditions in the hospitals	1) Agree	33 (82.5)	12 (70.6)	21 (91.3)	0.100*	16 (84.2)	17 (81.0)	0.559*	6 (75.0)	18 (85.7)	9 (81.8)	0.801
	2) Disagree	7 (17.5)	15 (29.4)	2 (8.7)		3 (15.8)	4 (19.0)		2 (25.0)	3 (14.3)	2 (!8.2)	
4. I think that my colleagues would like to wiling to implement the telemedicine technology	1) Agree	37 (92.5)	15 (88.2)	22 (95.7)	0.385*	17 (89.5)	20 (95.2)	0.462*	7 (87.5)	21 (100)	9 (81.8)	0.150
	2) Disagree	3 (7.5)	2 (!1.8)	1 (4.3)		2 (!0.5)	1 (4.8)		1 (!2.5)	0 (0.0)	2 (18.2)	
5. Telemedicine system can be integrated within the existing system	1) Agree	37 (92.5)	14 (82.4)	23 (100)	0.069*	17 (89.5)	20 (95.2)	0.462*	7 (87.5)	19 (90.5)	11 (100)	0.521
	2) Disagree	3 (7.5)	3 (17.6)	0 (0.0)		2 (10.5)	1 (4.8)		1 (12.5)	2 (9.5)	0 (0.0)	

* statistical analysis used Fisher's exact test, otherwise the statistical analysis used Chi-square test

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Table 6. Scores of knowledge, perception, willingness toward telemedicine

No	Description	Mean (SD)	95% CI	Median (IQR)	Min-Max	Normality Test (p-value)*
1	Knowledge score (out of 100)	58.8 (13.4)	54.5-63.1	61.9 (47.6-66.7)	33.3-80.9	0.005
2	Perception score (out of 100)	87.5 (20.1)	81.1-93.9	100 (80.0-100.0)	20-100	<0.001
3	Willingness score (out of 100)	91.5 (16.3)	86.3-96.7	100 (80.0-100.0)	40-100	<0.001
4	Total score (out of 300)	237.8 (35.1)	226..6-249.0	246.7 (212.4-266.7)	151.4-276.2	<0.001

* normality test used Kolmogorov-smirnov test

Table 7. Factors related to scores of knowledge, perception, willingness toward telemedicine

Score	Practice type Median (IQR)			Gender Median (IQR)			Age range Median (IQR)			
	GP (N=17)	Specialist (N=23)	p-value	Female (N=19)	Male (N=21)	p-value	< 31 yo (N=8)	31-40 yo (N=21)	> 40 yo (N=11)	p-value
1. Knowledge score	52.4 (45.2-66.7)	66.7 (52.3-71.4)	0.075	61.9 (47.6-66.7)	66.7 (50.0-69.0)	0.594	59.5 (44.0-66.7)	61.9 (50.0-69.0)	66.7 (47.6-71.4)	0.594*
2. Perception score	100 (80-100)	100 (80-100)	0.704	100 (100-100)	80 (70-100)	0.032	100 (80-100)	100 (80-100)	100 (80-100)	0.670*
3. Willingness score	100 (80-100)	100 (100-100)	0.021	100 (80-100)	100 (80-100)	0.035	100 (80-100)	100 (90-100)	100 (80-100)	0.737*
4. Total score	241.9 (197.6-261.9)	257.1 (238.1-266.7)	0.158	257.1 (233.3-266.7)	241.9 (207.6-266.7)	0.423	244.3 (214.0-264.3)	241.9 (212.4-266.7)	257.1 (212.4-266.7)	0.847*

* statistical analysis used independent-sample Kruskal wallis tests, otherwise the statistical analysis used U Mann-whitney test

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Table 8. Multivariate test on factors related to scores of knowledge, perception, willingness toward telemedicine

No	Factor	Knowledge Score			Perception Score			Willingness Score		
		Beta	p-value*	R^2	Beta	p-value*	R^2	Beta	p-value*	R^2
1	Practice Type (0: GP, 1: specialist)	7.144	0.155		2.952	0.682		13.922	0.020	
2	Gender (0: Female, 1:Male)	-0.348	0.936	0.074	14.504	0.027	0.129	-0.096	0.985	0.151
3	Age range (0:<31 yo, 1:31-40yo, 2:>40yo)	0.110	0.975		1.046	0.838		-6.498	0.118	
4	Constant	54.749			77.789			90.526		

* statistical analysis used multvariate linear regression

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Discussion

This research has shown that telemedicine is an interesting field of study as it continues to be a business model that attracts many healthcare business professionals.

It is quite worth noting that, when the question for each variable is measured by individual questions, only the knowledge variable has some significant differences by practice type on attending conference on telemedicine and conversely GPs were less familiar with telemedicine guidelines. On the other hand, when the questions were analyzed individually for perception and willingness, there were no significant differences found across practice type, gender and age range. Interestingly, when the questions were accumulated through scoring system, knowledge variable has no significant difference across practice type, gender and age range, while perception variable has significant difference on gender, and willingness variable has significant differences when it comes to practice type and gender.

CONCLUSION

Based on the results of data analysis in the assessment of medical doctor's knowledge, perception, and willingness towards telemedicine in three Siloam Hospitals in Bali, it can be concluded that

1) On the factor related to computer access, male doctors have low likelihood to contact patients via online (P value = 0.035), the younger the age, the higher the tendency to obtain information from online sources to be given to patients (P value = 0.037). General Practitioners do more literature search in terms of telemedicine (P value= 0.013).

2) On the knowledge variable, Specialists/Consultants attended conferences more than their General Practitioner counterparts (P value = 0.015). GP are less familiar with telemedicine guidelines.

3) On the perception variable, there is no significant difference across practice type, gender, and age

4) Similar to perception variable, there is also no significant difference across practice type, gender and age for willingness variable.

5) Factors related to scores of knowledge, perception, willingness toward telemedicine, it shows that when the score is accumulated, knowledge has no significant difference across practice type, gender, and age range. Meanwhile, perception was significantly different based on gender and willingness showed significant differences based on practice type and gender.

Below are the recommendations from this research which covers three areas: further research in telemedicine, hospitals, and medical doctors.

For further research, this research has laid out the foundation for knowledge, perception, and willingness toward telemedicine. As quantitative instrument was used in this research, the results cannot holistically measure the knowledge, perception and willingness toward telemedicine. A qualitative study is needed to comprehensively measure the knowledge, perception and willingness toward telemedicine, thus providing a holistic understanding of the status of medical doctors' knowledge, perception and willingness toward telemedicine.

Hospitals, particularly private hospitals which depend mostly on the patients as the source of revenue generation, shall make any endeavor to ensure that its employees, particularly medical doctors are equipped with sufficient knowledge, right perception and willingness to use telemedicine as telemedicine has become one of business channel of hospitals business as opposed to traditional Out-Patient services. Training for medical doctors on telemedicine is needed to ensure that they are up to date of the current guidelines, and confident to serve patients virtually.

Medical doctors as the primary providers in the hospitals should be able to be resilient in this rapidly-changing medical world. As the need for telemedicine is emerging, medical doctors need to be able to understand the basic concept of telemedicine and later be active users of telemedicine so that patients may have the opportunity to have medical consultation not limited to hospital based treatment but patients might be served wherever they are as long as there is an internet connection.

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