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Examining the Factors Impacting Satisfaction and Loyalty in Innovative Personal Health Assistant Services for Hypertension Patients of a Private Hospital in Thailand

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Abstract

Purpose: The aim of this research is to examine the factors impacting satisfaction and loyalty in innovative personal health assistant services for hypertension patients of a private hospital in Bangkok, Thailand. **Research design, data and methodology:** Conceptual framework consisted with six variables, reliability, trustworthiness, service quality, hospital image, satisfaction and loyalty, was designed to achieve research objective. Quantitative approach was applied to collect data from 500 respondents. Sampling methods of purposive sampling, stratified random sampling, and convenience sampling were used to scoped to reach target respondents. The reliability of questionnaires has been verified with Item-Objective Congruence (IOC) and pilot test before distribution to target respondents. Data obtained was then analyzed with statistical method of Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM) to test hypothesis proposed for the study. **Results:** Loyalty was driven by satisfaction, while satisfaction was impacted from service quality, hospital image, and trustworthiness. Service quality played critical role for hypertension patient as it directly impacts satisfaction and hospital image, and indirectly impact loyalty. **Conclusions:** Marketers, healthcare, and developers of health virtual assistant should focus on delivering service, diagnosis and treatments that meet their needs or beyond their expectation to gain trust, positive hospital image, and satisfaction that consequently induces commitment in the service.

Keywords: Service Quality, Satisfaction, Loyalty, Hypertension, Health Assistant Services

JEL Classification Code: I10, L86, M10, O30

1. Introduction

With the global spread of COVID-2019, 'new normal' has adopted to promotes social distancing and encourage people to remain at home. Digital platform has become a substitute for activities that is inevitable or has limited access from home. The pandemic has put health and wellness in the top of mind of consumers, so health digital platform is one of the digital tools that has gained popularity e.g. Mor Prom the national digital health platform (Vananupong, 2022). The growth of digital health market has accelerated mainly due to the increase usage of internet and smartphones, trends toward healthier lifestyles, and particularly from COVID-19 pandemic. The benefits of digital health have projected the market in becoming

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mainstream and would continue to grow over the years. Revenue of Thailand's digital health sector is forecasted to reach USD 639.20 million in 2022, where the segment that highly contributes to the sector is digital fitness and well-being at USD 354.40 million, followed by eHealth at USD 284.80 million (Statista, 2022).

COVID-19 pandemic has pressure digital health market to broaden access of health services to individuals for health monitoring. The Ministry of Public Health has collaborated with other relevant government agencies such as the Medical Council of Thailand and Food and Drug Administration to transformed digital health care by enabling remote doctor consultation via mobile devices, and telemedicine treatment and drugs dispensing (Tungsuwan et al., 2022). COVID-19 is not the only pressure on digital health system enhancement, ageing society is another concern. In 2016, 11% of Thais or 7.5 million people are aged above 65 years old, whereas in 1995, people aged above 65 years old were accounted for only 5% of total population. Aging society is forecasted to rise up to 17 million people by 2040 (World Bank, 2016). Therefore, it is important for the government and society to develop supportive health programs and policies to accommodate healthy aging in elderly.

Age group that hypertension symptoms should be aware of is at or above 45 years old. Hypertension is Thais are consistently increase from 21% in 2003 to 25% in 2014 (World Health Organization [WHO], 2019). Hypertension can lead to life-threaten health conditions. By enhancing the control and monitoring of hypertension, it can help prevent evolving controllable symptoms to life-threaten health conditions or reduces number of death and patients with cardiovascular disease (WHO, 2021). Therefore, the personal health assistant service can address these health procedures for hypertension control. Health virtual assistant (HVA) is a solution for healthcare service providers to provide better health care experience to patients with commitment to safety, quality, and service. It is the opportunity for the innovation of innovative personal health assistant services as many hospitals worldwide start to offer/design programs for patients, but it is not yet available in Thailand. The service would address the increasing of hypertension prevalence in aging population of Thailand.

There are limited literatures on health assistant services, hence this study focuses on examining the factors impacting satisfaction and loyalty in innovative personal health services for hypertension patients. By achieving customer satisfaction and loyalty, the hospital can successfully turn innovation to long-term profits (Strauss et al., 2013). The private hospital was selected for the case study as the hospital is a world-class healthcare service provider in Thailand and is one of the largest and leading hospitals in Southeast Asia. The hospital has aim to provide innovative clinical and service experiences, accomplish operational excellence, and create transdisciplinary care teams with humanized care and quality. The findings of this research would benefit the marketers, healthcare facilities and developers of health virtual assistant to understand the factors that contributes to hypertension patients' satisfaction and loyalty in using the service.

2. Literature Review

The study has aim to identify factors influencing satisfaction and loyalty in innovative personal health assistant services for hypertension patients in order to develop effective and innovative services. It would encourage long-term usage, and consequently help response to the situation of aging society, hypertension prevalence, development of digital health and consumer demand. Therefore, it is important to understand the significant factors that drives patient satisfaction and loyalty in the service. The factors studied include reliability, trustworthiness, service quality, hospital image, satisfaction, and loyalty.

2.1 Reliability

Hashim (1984) has conceptualized reliability as "the measure of state of mind, a state of confidence, a state of knowledge". Reliability helps control errors from estimating, predicting, and eliminating causes of service failure (Van Raaij & Pruyn, 1998). In SERVQUAL, reliability has been defined as "the ability to perform the promised service dependably and accurately" (Parasuraman et al., 1988). Reliability is essential for the industry as it can be one of the factors used to assess the effectiveness of these service sector especially in high credence service such as healthcare. Javed and Ilyas (2018) has assessed the impact of patients' satisfactions and service qualities and concluded that reliability was positively related to satisfaction despite diverse characteristics of patients from all-sized hospitals. Likewise, Javed and Liu (2018) and Ratnawati et al. (2021) have found that reliability was the strongest influencer of patient satisfaction both in private and public sector. The hypothesis was then proposed as follow:

H1: Reliability has significant impact on satisfaction.

2.2 Trustworthiness

Trustworthiness is an individual's series of beliefs that causes his or her willingness to trust (Sekhon et al., 2014). In other words, it is the customers' beliefs that the counterparty will act in their best interest. Trust can be formed through understanding on the needs and expectation

of the customers. Similarly, Caldwell and Clapham (2003) have defined trustworthiness as the accumulated perceptual experiences that causes an individual to trust counterparty. Its key components were posited of competency, ability and expertise. Padma et al. (2009) has described trustworthiness in the hospitals as patients' positive feeling towards the hospital, sense of well-being, attitude of health professionals and staff, medical equipment for treatment, and security. These factors can enhance the confidence level of patients and leads to satisfactory experience. Trustworthiness of the hospital significantly contributes to patient satisfaction both from private and government hospitals (Padma et al., 2010). Likewise, Yeo et al. (2021) and Zineldin (2015) concluded that trustworthiness has direct relationship with patient satisfaction, and patient satisfaction also have mediating relationship between trustworthiness and patient loyalty. The hypothesis was then proposed as follow:

H2: Trustworthiness has significant impact on satisfaction.

2.3 Service Quality

Service quality was defined by Parasuraman et al. (1985) as the variance of perceived service and expectation of the customers. Service quality measures service performance perceived by the customers based on their attitude and judgement (Parasuraman et al., 1994). It reflects the perception of customers towards service quality rather than the level of service quality in the views of the organization (Berry et al., 1988). Delivering the service as per patients' needs and expectations is important to portray the superiority of service quality and maintain the profitability as well as competitive advantage to the healthcare facilities (Donabedian, 1980). Patient satisfaction towards the healthcare is usually the outcome of perceived service quality and reflect the success how well the healthcare providers have performed their services (Sawyer et al., 2013). Shabbir et al. (2016) stated that healthcare service quality perceived by patients favorably correlated with their satisfaction, and patient satisfaction also mediates the correlation between service quality and patient loyalty. The result also aligned with the study of Chen and Fu (2015) and Ladhari and Rigaux-Bricmont (2013) that service quality significantly influenced satisfaction.

Bon and Mustafa (2013) have also highlighted that service quality is one of the fundamental factors that can help the organization achieve success, sustain marketing positions, and build superiority over other healthcare providers in the industry. Service quality is one of the functional components that leads to formulation of hospital image (Qin et al., 2014; Singh, 2013). Patients' perception on service quality experienced can have positive or negative influence on hospitals image, depending on their expectation on the services (Durrah et al., 2015). The hypotheses were then proposed as follow:

H3: Service quality has significant impact on satisfaction.
H4: Service quality has significant impact on hospital image.

2.4 Hospital Image

Bernstein (1984) has defined image as the perception or impression of the target consumers. Hospital image is the image perceived by patients from the time of arrival to the hospital, experience in medical treatment until leaving the hospital. Macinnis and Price (1987) have interpreted hospital image as the results of patients' evaluation on previous experience, cognitive feelings and thoughts about the hospital that leads to the impression in their minds. Patients' perception and attitude towards the hospital formulates hospital image (Gay, 1986). Al-Refaie (2013) have explored hospital image in different attributes. Service quality and facilities contributed to hospital image and significantly influences patient satisfaction. Similar to Cham et al. (2016), that study the behavior medical tourists. Hospital image was found to influenced patient satisfaction. The study of Khodadad Hosseini and Behboudi (2017) has highlighted that brand image has the strongest impact on customer satisfaction and significantly impact on using healthcare services. Coutinho et al. (2019) also posited the significant influence of corporate image on outpatient satisfaction. The hypothesis was then proposed as follow:

H5: Hospital image has significant impact on satisfaction.

2.5 Satisfaction

Satisfaction is a feeling or emotion from an experience or after completing a task. Satisfaction is evaluated from psychological aspects such as affective, feeling, emotion, cognitive thinking, and behavioral intention (Spiridon et al., 2018). Bhattacherjee (2001) has refer satisfaction to the psychological measurement of customers regarding the impression or experience with the product or service. As well as Brown et al. (2008) that has described satisfaction as the impression related to the quality of services received. It is the pleasure of perceived quality against expectation that customers have experienced during or after consumption of product or service (Oliver, 2014). Patient satisfaction can subsequently build loyalty, hence the study of relationship between satisfaction and loyalty is greatly emphasize in the service firms (Chahal & Mehta, 2014). Once patients are satisfied, loyalty is expected to be achieved (Abekah-Nkrumah et al., 2021). Patient satisfaction directly correlated with patient loyalty, which implies that an emphasize should be given on patients' needs to retain customers and sustain the hospital's growth (Yeo et al., 2021). Patient satisfaction was a significant determinants of patient loyalty (Vimla & Taneja, 2020). The hypothesis was then proposed as follow:

H6: Satisfaction has significant impact on loyalty.

2.6 Loyalty

Loyalty is the customers' psychological beliefs and attitude toward a product or service. The favorable or unfavorable beliefs and attitudes will lead to their buying decision (Ajzen, 1988). Loyalty is a deep customers' commitment in repurchasing or repatronizing the favored product or service consistently in the future (Oliver, 1997). Lee and Cunningham (2001) have claimed that loyalty consist of three dimensions, brand preferences, attachment to the product, and customers' evaluation of brand attitudes. Anbori et al. (2010) has referred patient loyalty as a strategic service plan to secure and sustain customers by providing superior service qualities. Customer service loyalty is critical for businesses retain customers for sustain performance and profitability. It portrays how likely a customer is willing to continue their service with the same service provider or switch to other alternatives. As service loyalty increases, threat of competitive actions decreases (Rauyruen et al., 2009). There can be number of factors and stages in formation of customer loyalty. Hence, loyalty is widely studied to determine its significant antecedents.

3. Research Methods and Materials

3.1 Research Framework

Research conceptual framework as illustrated in figure 1 was developed from four theoretical frameworks in the related field of study. Previous research and its finding on causal impact were studied to developed conceptual framework with six variables and examine the factors impacting satisfaction and loyalty of hypertension patients. The positive correlations between trustworthiness and satisfaction were adapted from the research of Padma et al. (2009) that has studied the dimensions of service quality impacting satisfaction and behavioral intention. The next relationship between service quality, satisfaction, and loyalty was grounded from the research of Dayan et al. (2022) that examined the factors influencing satisfaction and loyalty of outpatients. The study of Ratnawati et al. (2021) was reviewed to reference the association of reliability, satisfaction, and loyalty. Lastly, the relationships among service quality, hospital image, and satisfaction were based on the research examined by Coutinho et al. (2019). As a result, the conceptual framework consists of six variables, namely, reliability, trustworthiness, service quality, hospital image, satisfaction, and loyalty.

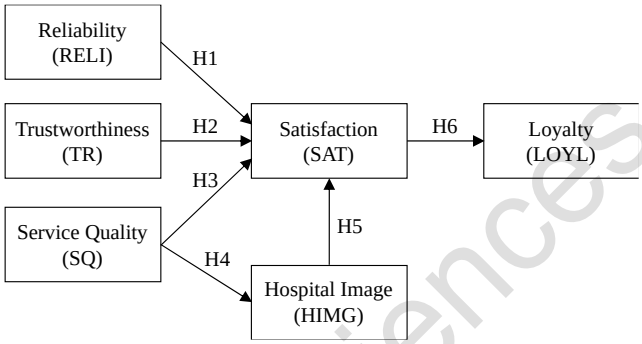

Figure 1: Research Framework

3.2 Methodology

Quantitative approach was applied for this research to collect data for analysis of factors impacting satisfaction and loyalty in personal health assistant service for hypertension patients. Data was obtained from questionnaire distribution to target respondents who are patients with hypertension symptoms at a private hospital. The distribution was performed based on sampling techniques of probability and non-probability sampling to reach target respondents. Questionnaire was constructed with Microsoft form with three sections. First section was screening questions to sort respondents to target group for the study. Second section was variable items for measurement using five-point Likert scale, from strongly disagree (1) to strongly agree (5) (Likert, 1932). Third section was demographic questions to collect demographic characteristics of the respondents. The variable items have been tested for internal consistency and reliability by Item-Objective Congruence (IOC) with three experts and pilot test with 50 respondents. Confirmatory factor analysis (CFA) and structural equation modeling (SEM) were further assessed using SPSS version 14.0 and AMOS version 6.0 statistical tools to test the validity and fitness of model for hypothesis testing.

3.3 Target Population and Sample Size

The population for this research was targeted at a private hospital's patients with hypertension symptoms and age at or above 40 years old. Hypertension patient in this context of study is individual who consistently have high blood pressure level at or beyond 140/90 mmHg (Bumrungrad International Hospital, n.d.). As possibility of having hypertension rises with age (NHS, 2019), 40 years old and above are age range that the author has focused and clustered to four generations of Generation Y (40-49 years-old), Generation X (50-59 years-old), Baby Boomer (60-69 years-old), and Senior Citizen (70 years-old and above).

A-priori Sample Size Calculator for Structural Equation Models from danielsoper's website was used to calculate recommended sample size for this study. The measured model consists of 6 latent variables, 24 observed variables shown and a probability level of 0.05, which resulting to a recommended minimum sample size at 403 (Soper, 2023). The author has decided to set sample size at 500 to exceed minimum size.

3.3 Sampling Procedure

Sampling techniques of probability and non-probability were applied to reach target respondents for data collection. Purposive or judgmental sampling method was firstly used to choose respondents of hypertension patients at a private hospital with aged in the four generations of Generation Y (40-49 years-old), Generation X (50-59 years-old), Baby Boomer (60-69 years-old), and Senior Citizen (70 years-old and above). Stratified random sampling was secondly used divide sample size of 500 sets to hypertension patients of four generations proportionately. The allocation of sample size is showed in table 1. Convenience sampling was lastly used to distribution online link of questionnaires to any respondents that are available and willing to participate during the time of distribution at the hospital site.

Table 1: Sample Size of Patients by Generations

Generation	Patients with Hypertension	Proportion Percentage	Sample Size
Generation Y	4,832	20	102
Generation X	6,124	26	130
Baby Boomer	6,025	26	128
Senior Citizen	6,633	28	140
Total	**23,614**	**100**	**500**

Source: Constructed by Author (Based on the data obtained from BH)

4. Results and Discussion

4.1 Demographic Information

The demographic characteristics of 500 respondents are presented in table 2. Respondents of hypertension patients are males at 54.2 percent (271) and females at 45.8 percent (229). In addition, their nationality are Thai at 70.2 percent (351) and non-Thai at 29.8 percent (149). The respondents are age at 40-49 years old at 20.4 percent (102), 50-59 years old at 26.0 percent (130), 60-69 years old at 25.6 percent (128), and 70 years old and up at 28.0 percent (140).

Table 2: Demographic Information

Demographic and Behavior Data (N=500)		Frequency	Percentage
Gender	Male	271	54.2
	Female	229	45.8
Nationality	Thai	351	70.2
	Non-Thai	149	29.8
Age	40-49 Years-old	102	20.4
	50-59 Years-old	130	26.0
	60-69 Years-old	128	25.6
	70 Years-old and up	140	28.0

4.2 Confirmatory Factor Analysis (CFA)

Confirmatory factor analysis or CFA was used to measure the correlation between latent variables and measured variable and assess the quality of measured variables in terms of validity and reliability (Bollen, 2001). CFA statistically tests construct validity that consisted of convergent validity and discriminant validity. Convergent validity is measured by composite reliability (CR), Cronbach's alpha reliability (CA), factor loadings, and average variances extracted (AVE) (Fornell & Larcker, 1981). Hair et al. (2018) has suggested minimum CR at 0.60, minimum CA from Nunnally and Bernstein (1994) is reliable at 0.6, and minimum factor loading at 0.5 and AVE at 0.4 (Fornell & Larcker, 1981). The analysis of CFA in table 3 shows that all statistical values exceeded the minimum threshold and affirmed convergent validity.

Discriminant validity measures the association between the variable with an unrelated measure to test whether the variables are not related as intended (Bruce et al., 2008). Fornell & Larcker criterion is used for this study where the square root of average variance extracted or AVE is calculated for each item and compare with correlation of other constructs in the model (Fornell & Larcker, 1981). Table 4 has shown the calculation and square root AVEs were greater than the correlation of other constructs, hence represents discriminant validity.

Table 3: Confirmatory Factor Analysis (CFA), Composite Reliability (CR), and Average Variance Extracted (AVE) Results

Variable	Source of Questionnaire (Measurement Indicator)	No. of Item	Cronbach's Alpha	Factor Loading	CR	AVE
Reliability (RELI)	Dayan et al. (2022)	5	0.811	0.581 – 0.743	0.814	0.468
Trustworthiness (TR)	Padma et al. (2009)	4	0.766	0.614 – 0.729	0.768	0.454
Service quality (SQ)	Dayan et al. (2022) and Aagja and Garg (2010)	5	0.821	0.614 – 0.767	0.823	0.483
Hospital image (HIMG)	Dayan et al. (2022)	3	0.884	0.825 – 0.877	0.885	0.720
Satisfaction (SAT)	Dayan et al. (2022)	3	0.769	0.715 – 0.741	0.770	0.528
Loyalty (LOYL)	Dayan et al. (2022)	4	0.799	0.637 – 0.791	0.800	0.501

Note: CR = Composite Reliability, AVE = Average Variance Extracted

Table 4: Discriminant Validity

Variable	Factor Correlations					
	RELI	TR	SQ	HIMG	SAT	LOYL
RELI	**0.684**					
TR	0.654	**0.674**				
SQ	0.641	0.641	**0.695**			
HIMG	0.668	0.597	0.541	**0.848**		
SAT	0.519	0.549	0.543	0.539	**0.726**	
LOYL	0.300	0.244	0.225	0.318	0.265	**0.708**

Note: The diagonally listed value is the AVE square roots of the variables

4.3 Structural Equation Model (SEM)

Structural equation model or SEM was then statistically tested to assess the relationship among variables and the fitness of structural model to the data. Goodness-of-fit index is an indicator used to evaluate the model fitness. Results are compared with indices' criterion and adjust the model until the values fell within the range. Table 5 presents the statistical values of adjusted structural model, CMIN/df = 1.762; GFI = 0.932; AGFI = 0.915; NFI = 0.915; CFI = 0.961; TLI = 0.956; RMSEA = 0.039.

Table 5: Goodness of Fit for Structural Model

Index	Criterion	Statistical Value after Model Adjustment
CMIN/DF	< 3.00 (Hair et al., 2006)	1.762
GFI	≥ 0.90 (Hair et al., 2006)	0.932
AGFI	≥ 0.90 (Hair et al., 2006)	0.915
NFI	≥ 0.90 (Arbuckle, 1995)	0.915
CFI	≥ 0.90 (Hair et al., 2006)	0.961
TLI	≥ 0.90 (Hair et al., 2006)	0.956
RMSEA	< 0.05 (Browne & Cudeck, 1993)	0.039

Note: CMIN/DF = The ratio of the chi-square value to degree of freedom, GFI = goodness-of-fit index, AGFI = adjusted goodness-of-fit index, NFI = normalized fit index, CFI = comparative fit index, TLI = Tucker Lewis index and RMSEA = root mean square error of approximation

4.4 Research Hypothesis Testing Result

The significance of causal impact was examined from its standardized path coefficient and t-value. The result in table 6 has demonstrated that all hypotheses proposed were supported except for H1. Service quality was the strongest predictor of satisfaction and loyalty was significantly impacted by satisfaction of hypertension patients.

Table 6: Hypothesis Testing Result

Hypothesis		Standardized path coefficients (β)	t-value	Test Result
H1	RELI → SAT	0.064	0.764	Not Supported
H2	TR → SAT	0.206	2.415*	Supported
H3	SQ → SAT	0.252	2.274*	Supported
H4	SQ → HIMG	0.639	10.894*	Supported
H5	HIMG → SAT	0.242	3.626*	Supported
H6	SAT → LOYL	0.302	5.227*	Supported

Note: *=p-value<0.05

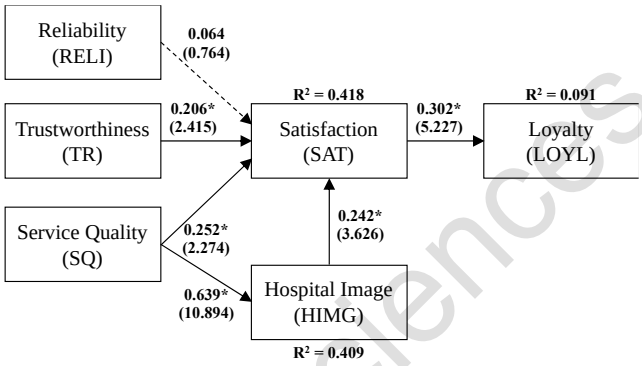

Figure 2: Revised Research Framework
Note: Solid line reported the Standardized Coefficient with *p<0.05, and t-value in Parentheses; Dash line (H1) reported not significant.

The presentation of table 6 and figure 2 are summarized as the following.

H1: Reliability has no significant impact on satisfaction from standardized path coefficient of 0.064 and t-value of 0.764. This finding contradicted with the research of Javed and Ilyas (2018) and Javed and Liu (2018) that reliability was the strongest influencer of patient satisfaction. Reliability of the service does not lead to satisfaction of hypertension patients.

H2: Trustworthiness has significant impact on satisfaction from standardized path coefficient of 0.206 and t-value of 2.415. Patients' confidence and positive attitudes toward the service contributes to their favorable experience and satisfaction. This statement has also proven by research of Yeo et al. (2021) and Zineldin (2015) on their direct relationship.

H3: Service quality has significant impact on satisfaction from standardized path coefficient of 0.252 and t-value of 2.274. Service quality is the strongest predictor of satisfaction, hence the delivery of service quality that met the needs and expectations of patients can potentially lead to their satisfaction on the service. This aligned with the conclusion of research conducted by Sawyer et al. (2013) and Shabbir et al. (2016).

H4: Service quality has significant impact on hospital image from standardized path coefficient of 0.252 and t-value of 2.274. Superiority of service quality offer can help build positioning and reputation of hospital, vice versa, poor service quality can deteriorate hospital image. It is depending on the patients' expectation on the services (Bon & Mustafa, 2013; Durrah et al., 2015; Qin et al., 2014).

H5: Hospital image has significant impact on satisfaction from standardized path coefficient of 0.242 and t-value of 3.626. Positive image and reputation of the hospital drive patient satisfaction in using the service. Hospital image is the second strongest predictor of satisfaction in the model. Coutinho et al. (2019) and

Khodadad Hosseini and Behboudi (2017) have also highlighted the direct relationship between hospital image and satisfaction.

H6: Satisfaction has significant impact on loyalty from standardized path coefficient of 0.302 and t-value of 5.227. The favorable impression that patients experienced can build preference and attachment to the service over time, hence this reiterates the importance of satisfaction to help the sustain the organization. This finding is consistent with the study of Abekah-Nkrumah et al. (2021), Vimla and Taneja (2020), and Yeo et al. (2021).

5. Conclusions

5.1 Conclusions

The aim of this research is to examine the factors impacting hypertension patients' satisfaction and loyalty in innovative personal health assistant services. The research is a case study conducted with the group of hypertension patients at a private hospital in Bangkok, Thailand and age at or above 40 years old. The conceptual framework developed to explain satisfaction and loyalty was done based on previous studies and theoretical frameworks. Six variables were included in the framework, namely, reliability, trustworthiness, service quality, hospital image, satisfaction, and loyalty. Data for analysis was collected quantitatively via questionnaire distribution to target respondents. Questionnaire was validated with three experts using IOC and pilot test with 50 respondents to ensure reliability of items measurement.500 valid data sets were obtained and analyze with CFA and SEM to verify the research model and hypotheses proposed. The results have shown that five out of six hypotheses were supported with data. Trustworthiness, service quality, and hospital image had significant impact on satisfaction, and satisfaction had significant impact on loyalty.

The significant relationship between service quality, hospital image, and satisfaction has proven the theory proposed by Coutinho et al. (2019). Service quality of healthcare competencies and facilities can lead to satisfactory experience and form positive perception towards hospital in the mind of patients. However, the insignificant relationship of reliability and satisfaction could be explained that due to the high credence service and the intangibility of services, it may be difficult for patients to assess the level of service reliability or whether the service outcome is dependable and accurate. Therefore, it does not influence their satisfactory. However, satisfaction can be earned from trustworthiness. Trustworthiness was the third strongest predictor of satisfaction. Positive feeling of patients towards the service, assistance received, and sense of well-being that forms confident in the service can lead to satisfactory experience. Lasty, the significant relationship of satisfaction and loyalty are supported by customer satisfaction model that Van Haaften (2017) has applied for the research. Service quality and hospital image are factors that drive customer satisfaction index and consequently leads to customer loyalty. Therefore, the marketers, healthcare facilities and developers of health virtual assistant should focus on delivering premium service quality and building positive reputation to enhance patients' satisfaction and loyalty in the personal health assistant services.

5.2 Recommendation

Significant factors impacting satisfaction and loyalty in innovative personal health assistant services were service quality, hospital image, and trustworthiness. Service quality impacted satisfaction the most, hence this factor should be firstly prioritized by the marketers and healthcare facilities in implementation.

Service quality will be perceived as well delivered when the service performance is beyond the expectations of patients. Also, it could potentially create trustworthiness in the service. Therefore, feedback or comment box can be used as a tool to collect the needs and expectations of patients when using the service. These direct feedbacks can be utilized for service development and build other relevant strategies to gain trust and satisfaction from patients.

As patients' perception and attitude towards to service can portray the hospital image, developers of health virtual assistant should ensure that patient experience and engagement while using the service, from registering until medical outcome are efficient and favorable such as responsiveness, courtesy, and consistency. This could lead to a positive impression in their minds and motivates service continuance or service loyalty.

5.2 Limitation and Further Study

For further study of this research, the scope of target population can be extended to other groups. This may result to different explanations on patients' attitude and behavior such as conducting the study on patients at different private or public healthcare organizations, and different geographical regions. Also, control variables can be included in the conceptual framework such as age and income to assess whether it mediates the relationship towards satisfaction and loyalty in personal health assistant service.

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