

# The Intention to Use Telemedicine by Surgical Patients in Response to COVID-19

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## ABSTRACT

**Objective:** This study explored patients' intention to use telemedicine instead of traveling to a hospital during the current global COVID-19 crisis. The framework focused on the relationships between variables derived from the technology acceptance model and the extended unified theory of acceptance and use of technology model.

**Materials and Methods:** Multistage sampling procedures were applied to recruit samples using nonprobability sampling methods. Adult patients who had undergone surgery at a university hospital participated; all were experienced in using online meeting applications and online payment services in their daily lives. Consent forms and online questionnaires were distributed via a Google Forms link.

**Results:** Between October and December 2021, 502 patients undergoing procedures participated in the study. Five variables—social influence, trust, price, perceived usefulness, and perceived ease of use—significantly impacted intention to use. Perceived ease of use significantly impacted perceived usefulness, with a value of 0.679<sup>\*\*\*</sup>. In addition, perceived ease of use indirectly influenced intention to use (impact value, 0.103<sup>\*\*\*</sup>). Performance expectancy did not significantly impact intention to use, with an impact value of -0.012.

**Conclusion:** The contributions of this study will enable developers, medical professionals, and marketers to improve telemedicine services to better satisfy patients undergoing surgery and increase their intention to use telemedicine. However, the performance expectancy aspect may not warrant patients' intention. Additionally, the research is recommended on other potential variables influencing telemedicine utilization, such as psychological expectations, performance expectations, and technical conditions.

**Keywords:** Telemedicine; Covid 19; surgery; intention to use (Siriraj Med J 2022; 74: 804-818)

## INTRODUCTION

The word “telemedicine” was coined in the late 1970s to denote a system of “healing at a distance.”<sup>1</sup> It draws upon information communication technology to enhance the outcomes of patients by broadening their options for obtaining healthcare services and information on medical conditions. In terms of surgical application, telemedicine has been employed for consultations and patient monitoring both before and after operations. Bullard and coauthors<sup>2</sup> reported that computerized

tomography scans transmitted via mobile telephones provided sufficient clarity to permit neurosurgeons to make decisions about their patients' surgical management. Moreover, mobile telephone technology obviated the need to physically move 30% to 50% of patients from referring hospitals to other facilities. Other research on the postoperative management revealed that telemedicine was safe, effective and significantly reduced the need to travel to the hospital.<sup>3,4</sup>

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Before the COVID-19 pandemic, surgical specialists rarely accepted the use of telemedicine. This was primarily because access to broadband or satellite services was unreliable,<sup>5</sup> even though telemedicine services across Thailand would offer substantial benefits to medical providers and patients. Nevertheless, following the COVID-19 pandemic, several Thai providers developed applications and telemedicine services for use at various clinics and hospitals, including Siriraj Hospital.<sup>6-8</sup> Siriraj Hospital launched a telemedicine application, named “Siriraj Connect,” to service patients in April 2020. Patients could request telemedicine consultations via Siriraj Connect. The notification message allowed patients to confirm the appointments and prepare their mobile devices for the doctor’s video call. Patients could use Siriraj Connect to pay for consultations and medications via online banking. Siriraj Connect also allowed patients to cancel or postpone their surgery follow-up sessions. Patients were encouraged to have online follow-ups to avoid the need to physically visit the hospital. Nevertheless, only 3,916 patients (2.7%) out of 145,515 patients who had hospital appointments were actual users of Siriraj Connect between March 2020 and January 2021.<sup>9</sup>

Several theoretical models have been proposed to examine factors associated with adopting new information technology. The Technology Acceptance Model (TAM) is particularly attractive because of its consistently good predictive records in healthcare settings.<sup>10</sup> According to the TAM, there are two beliefs are recognized as key to individual acceptance, which are perceived usefulness and perceived ease of use. Perceived usefulness refers to the extent to which someone considers that a system’s usage will boost their work performance. As to perceived ease of use, it references the extent that a person considers that the usage will be without physical or mental effort.<sup>11</sup> Venkatesh and associates introduced the extended unified theory of acceptance and use of technology model (UTAUT2). This model demonstrates a rich understanding of information technology and an ability to help consumer technology organizations develop improved designs and enhanced market technologies.<sup>12</sup> The key constructs in UTAUT2 relate to psychology and sociology. The constructs include performance expectancy, effort expectancy, social influence, and facilitating conditions. Additional key constructs of UTAUT2 are hedonic motivation, habit, and price value.<sup>12</sup> All key constructs were proposed as direct antecedents of behavioral intention.

In addition to the barriers that need to be eliminated to promote the spread of telemedicine technology, patients’ intentions to utilize the technology are facilitated or influenced by an array of factors. The current work focused

on the relationships between the variables. Therefore, the objective of this study was to explore factors influencing patients’ intention to use telemedicine instead of traveling to the hospital for activities such as health education, laboratory investigations, or follow-up during the global COVID-19 crisis.

## **MATERIALS AND METHODS**

### ***Research framework, hypotheses, and contextualized scale items***

The conceptual framework used in this research (Fig 1A) was based on 2 core theories and 4 major research studies.<sup>13</sup> The relationships between 7 variables were investigated. There were 6 independent variables (social influence, performance expectancy, trust, price, perceived usefulness, and perceived ease of use) and 1 dependent variable (intention to use). The following hypotheses are proposed:

- H1.* There is a statistically significant relationship between social influence and intention to use Siriraj Telemedicine application.
- H2.* There is a statistically significant relationship between performance expectancy and intention to use Siriraj Telemedicine application.
- H3.* There is a statistically significant relationship between trust and intention to use Siriraj Telemedicine application.
- H4.* There is a statistically significant relationship between price and intention to use Siriraj Telemedicine application.
- H5.* There is a statistically significant relationship between perceived usefulness and intention to use Siriraj Telemedicine application.
- H6.* There is a statistically significant relationship between perceived ease of use and intention to use Siriraj Telemedicine application.
- H7.* There is a statistically significant relationship between perceived ease of use and perceived usefulness.

This study used a quantitative approach and drew upon a survey questionnaire as a data collection tool. An information sheet, informed consent form, and questionnaire were created and presented to participants through a Google Forms survey. The questionnaire contained 36 items exploring the 7 variables influencing telemedicine usage (Appendix 1). The items were grouped into 4 main sections. The first was a set of screening questions, while the second section measured the 6 independent variables (social influence, performance expectancy, trust, price, perceived usefulness, and perceived ease of use). The third part measured the sole dependent variable (intention to use),

## APPENDIX 1

### QUESTIONNAIRE ENGLISH VERSION

This questionnaire is developed for the determination of the research on “Factors influencing the intention to use of telemedicine among surgical patients in response to the COVID 19 pandemic at Siriraj Hospital”. The study is conducted with regards to fulfilment the requirement of Philosophy Degree in Technology Education Management at Assumption University, Bangkok, Thailand. All the information collected of this study will be kept privately and will be used as the resolution of this study only. Thank you for your time and patience for response the answer.

#### Part I: Screening Questions

1. Have you ever undergone surgery or surgery follow up at Siriraj Hospital? (Select only 1)

Yes

No

2. Have you experienced using online meeting application such as Line VDO call, ZOOM, WebEx or Microsoft team? (Select only 1)

Yes

No

3. Have you experienced using online payment? (Select only 1)

Yes

No

#### Part II: Measuring Variables

Please answer the following question by mark “✓” in the space given below and do kindly answer truthfully and complete all questions.

1 = strongly disagree

2 = disagree

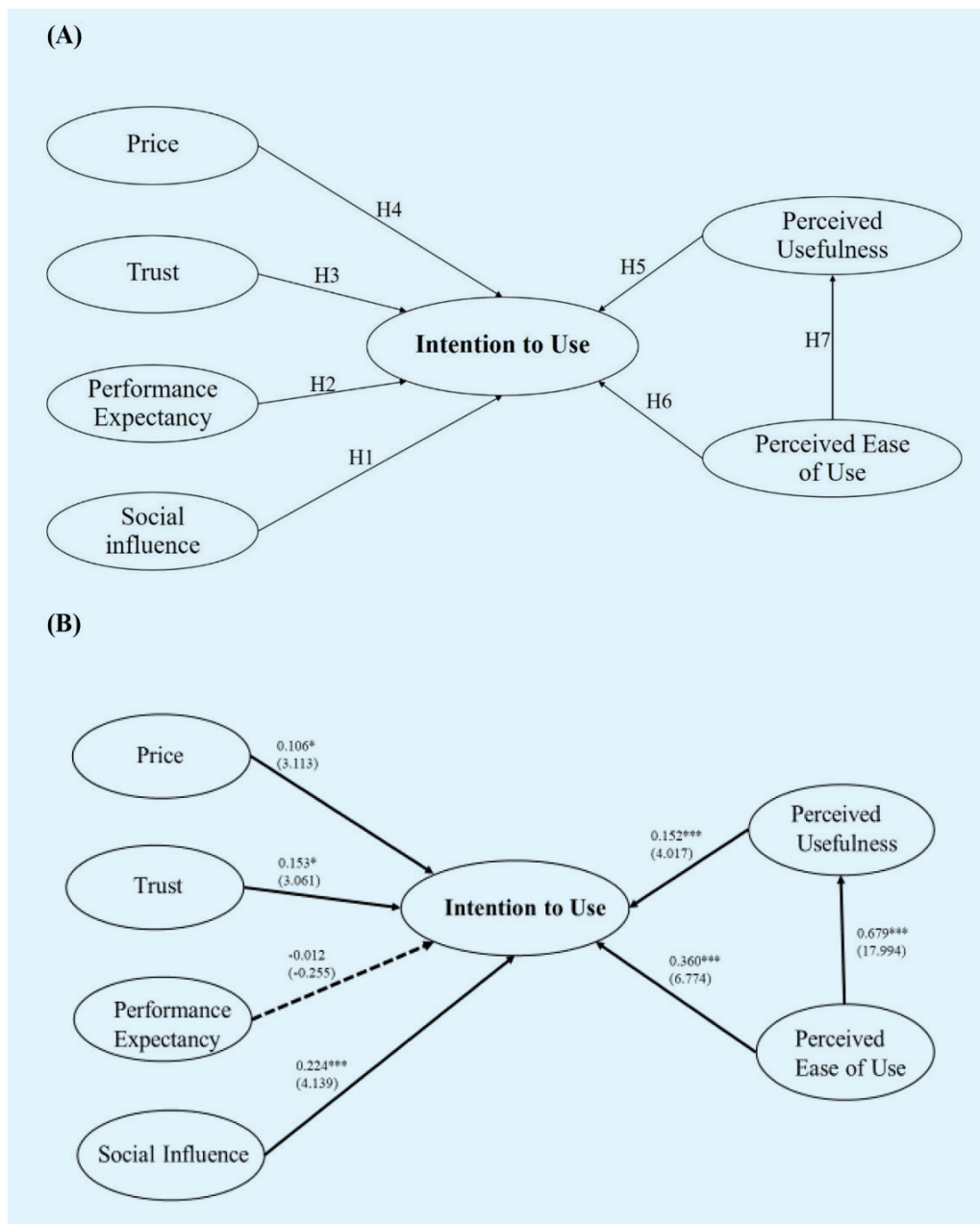
3 = neither agree nor disagree

4 = agree

5 = strongly agree

No	Items	1= strongly disagree	2= disagree	3= neither agree nor disagree	4= agree	5= strongly agree
<b>Social Influence</b>						
1	Friend suggestion and recommendation will affect my decision to use Siriraj telemedicine.					
2	Family members/ relatives have influence on my decision to use Siriraj telemedicine.					
3	I will use Siriraj telemedicine if the surgeon recommends to use it.					
4	Mass media (e.g., TV, newspaper, articles radio) will influence me to use Siriraj telemedicine.					
5	I will use Siriraj telemedicine if the service is widely used by people in my community.					
<b>Performance Expectancy</b>						
6	I can communicate with a doctor online.					
7	I can pay essential bills via Internet conveniently.					
8	I can manage my appointment online at anytime					
9	Siriraj telemedicine keeps a record of my health					
10	Siriraj telemedicine reduce obstacle to visit hospital in person.					
11	Siriraj telemedicine is easy to access					
<b>Trust</b>						
12	I think that Siriraj telemedicine will keep the promises and commitments that it makes					
13	Siriraj telemedicine makes me feel trustworthy the same as I visit the doctor at the hospital in person.					
14	I would describe Siriraj telemedicine as honest					
15	I think that Siriraj telemedicine is responsible					
16	In general, I trust in Siriraj telemedicine					
<b>Price</b>						
17	I am willing to use Siriraj telemedicine even though the follow-up fee may be increased					
18	I am willing to pay for Siriraj telemedicine service even I may need to pay more than I see the doctor in person at the hospital.					

No	Items	1= strongly disagree	2= disagree	3= neither agree nor disagree	4= agree	5= strongly agree
<b>Price</b>						
19	I am willing to pay for additional service fees for using Siriraj telemedicine.					
20	Siriraj telemedicine service fees may burden me.					
21	I am willing to use Siriraj telemedicine even though the total expenses are more expensive than visiting the doctor at the hospital.					
<b>Perceived usefulness</b>						
22	I find that Siriraj telemedicine is useful for follow-up my surgery conditions.					
23	Siriraj telemedicine makes me manage my health conditions effectively.					
24	Using Siriraj telemedicine makes me monitor my health condition conveniently.					
25	Using Siriraj telemedicine save me time to travel to the hospital.					
26	Using Siriraj telemedicine enables me to manage my health-related matters quickly.					
<b>Perceived ease of use</b>						
27	I believe that using Siriraj telemedicine system will not make me get confused.					
28	I believe that Siriraj telemedicine system is easy to understand.					
29	I believe that Siriraj telemedicine system is easy to use.					
30	I believe that Siriraj telemedicine is not cumbersome.					
<b>Intention to use</b>						
31	I am likely to use Siriraj telemedicine for my follow-up after surgery in the near future.					
32	I will see the surgeon via Siriraj telemedicine if I have given the opportunity.					
33	I am willing to use Siriraj telemedicine in the near future					
34	I have an intention to use Siriraj telemedicine for follow-up with the surgeon.					



**Fig 1.** (A) Conceptual framework; (B) Results of structural model.

and the last section collected demographic information. The questionnaire employed a 5-point Likert scale, with choices ranging from “strongly disagree” (1) to “strongly agree” (5). Before data collection, 3 experts tested the questionnaire scores to ensure that the item-objective congruence was  $> 0.6$ . A pilot study was administered to assess reliability, with the questionnaire distributed through a Google Forms survey to patients who had undergone surgery at Siriraj Hospital. Cronbach’s alpha reliability coefficient tested the internal consistency of the questionnaire. As all of the constructs in this study had an alpha coefficient above 0.8, they were reliable and adequate for use as a research instrument.

### ***Respondents and sampling procedure***

Before starting this research, the protocol was approved by the Ethics Review Committee for Research, Assumption University Institutional Review Board (AU IRB No. 1/2021). Written informed consent was obtained from anonymous respondents before they responded to the self-completion questionnaires. This study applied the nonprobability sampling technique to the quantitative sampling procedures with multistage sampling (judgment, quota, and convenience sampling). The questionnaire was distributed via Google Forms during October to December 2021. The inclusion criteria were adult patients (over 18 years) who had undergone surgery at Siriraj

Hospital and needed appointments for surgery follow-up. The patients had to be experienced in using online meeting applications and payment systems. Patients were excluded if they could not read or had difficulty using a smart phone, for example, vision problem or reading literacy problem.

### **Sample size calculation and statistical analysis**

Given the framework of 7 latent variables with 36 observed variables, an anticipated effect size of 0.2, and a probability level of 0.05, it was calculated that a minimum sample size of 425 would be required to determine effects. A goal of 500 responses was set and exceeded. Descriptive statistics were applied to describe respondents' demographic information in the form of frequencies and percentages. In addition, the mean and standard deviation are reported for the respondents' perceptions of the constructs.

A normality test was used to determine whether the data set was well modeled by a normal distribution and to calculate the probability that the random variables in the data set were normally distributed. Based on the work of Kim et al. (2013),<sup>14</sup> thresholds of skewness values between -0.500 and 0.500 denote that data are reasonably symmetrical. The values between -1.000 and -0.500, or between 0.500 and 1.000, indicate that the data are moderately skewed. However, values below -1.000 or exceeding 1.000 signify that the data are highly skewed. George and Mallery<sup>15</sup> assumed that the ideal value level for kurtosis ranges from -2.000 to +2.000.

Confirmatory factor analysis (CFA) and structural equation modeling (SEM) using the maximum likelihood method were performed. The internal consistency of the CFA factors was assessed with Cronbach's alpha coefficient. The statistical analyses were performed using IBM SPSS Statistics for Windows, version 28.0 (IBM Corp, Armonk, NY, USA). Analysis of Moment Structures (version 18.0) was used for the CFA and SEM analyses.

## **RESULTS**

### **Demographics, descriptive analysis of observed variables, and assessment of normality**

In this study, 502 patients responded to the questionnaire. The majority were women, representing 50.6% of the respondents, with men contributing 248 respondents (49.4%). As for the type of surgery, 41.8% of the respondents underwent minor surgery, 41.1% had intermediate surgery, and the remainder (17.2%) had major surgery. Half of the participants had a bachelor's degree or higher as their highest education level. Regarding the location of their permanent domicile, most respondents

lived in Bangkok or the central region of Thailand (Table 1).

The 5-point Likert scale measured respondents' perceptions of the 7 observed variables (social influence, performance expectancy, trust, price, perceived usefulness, perceived ease of use, and intention to use). Descriptive statistics (mean and standard deviation) were calculated and used to interpret the levels of agreement of the respondents on the observed variables influencing their intention to use the Siriraj Connect application. The mean values of the observed variables ranged from 3.19 to 4.32, and the standard deviations ranged from 0.81 to 1.07. The descriptive statistics and assessments of normality are detailed in Appendix 2. The overall values of skewness and kurtosis of this paper were acceptable.

### **Confirmation factor analysis**

CFA was utilized to evaluate the convergent and discriminant validity of the constructs and determine the model fit. To test convergent validity, the following criteria should be met, as suggested by Hair et al.<sup>16</sup>:

- The construct reliability (Cronbach alpha value) should be greater than 0.7.
- The explained variance (AVE) within each construct should be larger than 0.5.
- The standardized factor loading of each observed variable to the latent construct should be at least 0.60.
- The composite reliability (CR) should be at least 0.70.

All 4 criteria were met (Table 2). All the observed variables had a factor loading exceeding the recommended minimum of 0.774. Cronbach's alpha values were well above the minimum of 0.896. The AVE values for all constructs exceeded the minimum of 0.633, and the CR values met the minimum of 0.905. These results demonstrate that all of the constructs in this study achieved an acceptable level of convergent validity.

Campbell and Fiske<sup>17</sup> introduced the concept of discriminant validity in their research on evaluating test validity. They emphasized the importance of employing identification and convergence verification techniques when evaluating new tests. Discriminant validity occurs when the number of trait-correlation evaluations is  $\geq 2$ , with standard errors less than 1.00.<sup>18</sup> According to the data of discriminant validity (Table 3), the square roots of AVE demonstrated in the diagonal were 0.789, 0.873, 0.913, 0.887, 0.915, 0.939, and 0.947, and the maximum value of the coefficient for any two latent variables was 0.755. Based on these statistical data, discriminant validity for this study was achieved. Since convergent

**APPENDIX 2**

Mean, standard deviation and assessment of normality

Construct	Items	Mean	SD	Skewness	SE	Kurtosis	SE
Social Influence (SI)	SI1	3.753	1.002	-0.594	0.109	-0.078	0.218
	SI2	3.902	0.941	-0.736	0.109	0.212	0.218
	SI3	4.235	0.880	-1.195	0.109	1.440	0.218
	SI4	3.717	0.981	-0.494	0.109	-0.185	0.218
	SI5	3.939	0.972	-0.812	0.109	0.314	0.218
Performance Expectancy (PE)	PE1	4.221	0.812	-1.008	0.109	1.026	0.218
	PE2	4.193	0.861	-0.977	0.109	0.606	0.218
	PE3	4.234	0.865	-1.040	0.109	0.624	0.218
	PE4	4.102	0.886	-0.760	0.109	0.094	0.218
	PE5	4.321	0.822	-1.288	0.109	1.836	0.218
	PE6	4.086	0.937	-0.865	0.109	0.165	0.218
Trust (Trust)	Trust1	4.087	0.853	-0.672	0.109	-0.023	0.218
	Trust2	3.941	0.941	-0.598	0.109	-0.282	0.218
	Trust3	4.124	0.860	-0.667	0.109	-0.174	0.218
	Trust4	4.121	0.860	-0.751	0.109	0.153	0.218
	Trust5	4.106	0.854	-0.609	0.109	-0.230	0.218
Price (Price)	Price1	3.292	1.052	-0.101	0.109	-0.595	0.218
	Price2	3.203	1.071	-0.075	0.109	-0.643	0.218
	Price3	3.185	1.064	-0.084	0.109	-0.631	0.218
	Price4	3.202	1.063	-0.168	0.109	-0.438	0.218
	Price5	3.220	1.072	-0.132	0.109	-0.519	0.218
Perceived Usefulness (PU)	PU1	4.102	0.864	-0.722	0.109	-0.083	0.218
	PU2	3.991	0.871	-0.493	0.109	-0.384	0.218
	PU3	4.124	0.870	-0.706	0.109	-0.295	0.218
	PU4	4.287	0.860	-1.170	0.109	1.113	0.218
	PU5	4.152	0.870	-0.791	0.109	-0.070	0.218
Perceived Ease Of Use (PEOU)	PEOU1	3.816	0.925	-0.499	0.109	-0.241	0.218
	PEOU2	3.848	0.903	-0.495	0.109	-0.256	0.218
	PEOU3	3.823	0.914	-0.487	0.109	-0.290	0.218
	PEOU4	3.811	0.922	-0.505	0.109	-0.053	0.218
Intention to use (ITU)	ITU1	3.932	0.944	-0.549	0.109	-0.242	0.218
	ITU2	3.935	0.941	-0.516	0.109	-0.373	0.218
	ITU3	3.975	0.950	-0.583	0.109	-0.368	0.218
	ITU4	3.942	0.950	-0.573	0.109	-0.291	0.218

**Abbreviations:** SD; Standard Deviation, SE; Standard error



**TABLE 1.** Analysis of demographic characteristic (n = 502).

Demographic Information	Frequency (%)
<b>Age group (year)</b>	
< 34 years (young)	128 (25.5)
35–49 years (early middle-aged adults)	217 (43.2)
50–64 years (late middle-aged adults)	111 (22.1)
≥ 65 years (older adults)	46 (9.2)
<b>Sex</b>	
Male	248 (49.4%)
Female	254 (50.6%)
<b>Type of surgery</b>	
Minor surgery	210 (41.8%)
Intermediate surgery	206 (41.0%)
Major surgery	86 (17.2%)
<b>Education levels</b>	
Primary school	52 (10.4%)
High school/Higher secondary school	57 (11.4%)
Bachelor's degree	284 (56.5%)
Postgraduate (Master's/Doctorate)	109 (21.7%)
<b>Address</b>	
Bangkok	292 (58.2%)
<b>Other Regions</b>	
Central	117 (23.3%)
Northern	24 (4.7%)
North-eastern	35 (7.0%)
Western	6 (1.2%)
Eastern	8 (1.6%)
Southern	20 (4.0%)

Data presented as n (%)

**TABLE 2.** Confirmatory factor analysis result, composite reliability, average variance extracted, source of questionnaires, and number of questionnaire items.

Variable	Source of Questionnaire	No. of Questionnaire Items	Factor Loading > 0.5	CR (pc) > 0.7	AVE (pv) > 0.5
Social Influence	Wei et al. <sup>47</sup>	5	0.774-0.846	0.896	0.633
Performance Expectancy	Yuen et al. <sup>48</sup>	7	0.825-0.918	0.953	0.772
Trust	Kalinić et al. <sup>49</sup>	5	0.846-0.940	0.962	0.836
Price	Anouze and Alamro <sup>50</sup>	5	0.670-0.961	0.942	0.766
Perceived usefulness	Leon <sup>51</sup>	5	0.866-0.939	0.963	0.839
Perceived ease of use	Ozturk <sup>52</sup>	4	0.890-0.962	0.968	0.882
Intention to use	Zhao et al. <sup>53</sup>	5	0.916-0.965	0.972	0.897

**Abbreviations:** CR, composite reliability; AVE, average variance extracted

**TABLE 3.** Discriminant validity output.

	SI	PE	Trust	Price	PU	PEOU	ITU
SI	<b>0.789</b>						
PE	0.648	<b>0.873</b>					
Trust	0.653	0.707	<b>0.913</b>				
Price	0.448	0.372	0.508	<b>0.887</b>			
PU	0.645	0.678	0.670	0.424	<b>0.915</b>		
PEOU	0.604	0.624	0.707	0.544	0.646	<b>0.939</b>	
ITU	0.655	0.616	0.710	0.545	0.669	0.755	<b>0.947</b>

The diagonally listed values are the AVE square roots of the variables.

**Abbreviations:** SI, social influence; PE, performance expectancy; PU, perceived usefulness; PEOU, perceived ease of use; ITU, intention to use

and discriminant validity were proven, construct validity was established.

Based on the suggestion by Hair et al.,<sup>19</sup> the following criteria were used to determine model fit: chi-squared goodness of fit statistic over degrees of freedom (CMIN/DF); goodness-of-fit index (GFI); adjusted goodness-of-fit index (AGFI); normed fit index (NFI); comparative fit index (CFI); Tucker–Lewis index (TLI); and root mean square error of approximation (RMSEA). A research model with a good fit meets the following criteria: CMIN/DF > 5; GFI > 0.85; AGFI, NFI, CFI, and TLI > 0.8; and RMSEA < 0.08. The research model exceeded every criterion and achieved an acceptable model fit (Table 3).

### Structural equation model

The objective of this section was to evaluate and verify the structural instrument. After the first data examination stage in SEM, the investigators confirmed the goodness of fit for the SEM. Two classifications of the goodness of fits were performed to modify the SEM matrix. They included CMIN/DF, GFI, AGFI, and RMSEA from the absolute fit indices; and CFI and TLI from the incremental fit indices.

Next, the investigators modified the matrix according to the modification indices. The covariance was used to determine the interrelated deviation correlate and hence to obtain better fitness for the SEM matrix. The goodness-of-fit results before and after adjustment are summarized in Table 4 and illustrated in Fig 1B. Alternative hypotheses were examined after modifying the structural equation matrices whose goodness of fit matched the relevant standards. Table 5 details the hypothetical test results of the alternatives.

### Direct, indirect, and total effects

This research has 6 independent variables (social influence, performance expectancy, trust, price, perceived usefulness, and perceived ease of use) and 1 dependent variable (intention to use). The statistical results were related to the direct, indirect, and overall impacts of the 7 variables. The corresponding path analysis data are depicted in Fig 2B. R<sup>2</sup> was 0.683; this indicated that a 68.3% variance of intention to use could be determined by social influence, performance expectancy, trust, price, perceived usefulness, and perceived ease of use. Five variables—social influence, trust, price, perceived usefulness, and perceived ease of use—significantly impacted intention to use. The impact points were equivalent to 0.224<sup>\*\*\*</sup>, 0.153<sup>\*\*</sup>, 0.106<sup>\*\*</sup>, 0.152<sup>\*\*\*</sup> and 0.360<sup>\*\*\*</sup>, respectively. Perceived ease of use significantly impacted perceived usefulness, with a value of 0.679<sup>\*\*\*</sup>. In addition, perceived ease of use indirectly influenced intention to use (impact value, 0.103<sup>\*\*\*</sup>). Performance expectancy had no significant impact on intention to use, with an impact value of -0.012.

### DISCUSSION

This study explored factors influencing patients' intention to use telemedicine for health activities, such as health education, laboratory investigations, and annual follow-ups, instead of traveling to the hospital. To construct a conceptual model, the study drew upon factors influencing patients' intention to use the Siriraj Connect mobile application and 2 research models (the technology acceptance model, and the extended unified theory of acceptance and use of technology model). The research target group consisted of 502 patients who had

**TABLE 4.** Goodness of fit for measurement model before and after adjustment.

Index	Acceptable values	Sources	Statistical values before adjustment	Statistical values after adjustment
CMIN/DF	< 5.00	Awang <sup>54</sup> , Al-Mamary and Shamsuddin <sup>55</sup>	6.603	2.853
GFI	≥ 0.85	Sica and Ghisi <sup>56</sup>	0.660	0.857
AGFI	≥ 0.80	Sica and Ghisi <sup>56</sup>	0.612	0.829
NFI	≥ 0.80	Wu and Wang <sup>57</sup>	0.845	0.936
CFI	≥ 0.80	Bentler <sup>58</sup>	0.865	0.957
TLI	≥ 0.80	Sharma et. al. <sup>59</sup>	0.854	0.952
RMSEA	< 0.80	Pedroso et. al. <sup>60</sup>	0.106	0.061
<b>Model summary</b>			<b>Unacceptable model fit</b>	<b>Acceptable model fit</b>

**Abbreviations:** CMIN/DF, ratio of the chi-squared value to degree of freedom; GFI, goodness-of-fit index; AGFI, adjusted goodness-of-fit index; RMSEA, root-mean-square error of approximation; CFI, comparative fit index; TLI, Tucker–Lewis Index.

**TABLE 5.** Hypotheses Results of Structural Model.

Hypothesis	Standardized Path Coefficients (β)	t-Value	Hypothesis Result
H1: There is a significant relationship between social influence and intention to use.	0.224	4.139***	Supported
H2: There is a significant relationship between performance expectancy and intention to use.	-0.012	-0.255	Not Supported
H3: There is a significant relationship between trust and intention to use.	0.153	3.061**	Supported
H4: There is a significant relationship between price and intention to use.	0.106	3.113**	Supported
H5: There is a significant relationship between perceived usefulness and intention to use.	0.152	4.017***	Supported
H6: There is a significant relationship between perceived ease of use and intention to use.	0.360	6.774***	Supported
H7: There is a significant relationship between perceived ease of use and perceived usefulness.	0.679	17.994***	Supported

\*\*\* =  $P < 0.001$ ; \*\* =  $P < 0.01$ ; \* =  $P < 0.05$ .

undergone surgery and were being monitored through follow-up visits at Siriraj Hospital.

The results revealed that perceived ease of use, social influence, and perceived usefulness are the key factors that must be addressed when designing a new service platform. Perceived ease of use had the greatest influence on the patients' intention to use Siriraj Connect. The factors of trust and price had a lesser degree of influence on their intention to use the application. Perceived ease of use also had an indirect but significant impact on the perceived usefulness of the application. However, performance expectancy was not directly influential on intention to use.

From the consumer perspective, "social influence" refers to the extent to which consumers perceive that important others believe they should use a particular technology.<sup>12</sup> New technologies are considered products or services of high risk. For this reason, potential users tend to seek opinions about new technologies from others in their social surroundings, and the opinions of important others can influence them. Many researchers have confirmed the significant relationship between social influence and behavioral intentions.<sup>20-22</sup> In the context of the current investigation, the potential reference groups may not be just family members and friends. The groups may also include surgeons, nurses, people in the local community, and the mass media. The positive opinions of those members may encourage patients to contribute through the Siriraj Connect mobile application and increase their intention to use the application. Therefore, the hospital's public relations department and customer service staff should actively promote the concept that mobile applications are a new and helpful service interface. They should also indirectly enhance patients' intentions to use telemedicine by communicating its value to influential internal groups, such as surgeons, healthcare providers, and younger (technology-oriented) caregivers.

"Performance expectancy" refers to individuals' belief that using a particular technology or method will benefit them or improve their performance to at least some extent.<sup>23</sup> Performance expectancy has generally been demonstrated to be the primary predictor of intention to use a new form of information technology, irrespective of environmental factors.<sup>12,24,25</sup> Much research has supported the impact of performance expectancy on the behavioral intentions of consumers to adopt mobile banking services.<sup>26-29</sup> Performance expectancy was found to be significant for all the measurement points used in voluntary and mandatory settings, as participants were generally interested in knowing the benefits of technology for their performance.

In the context of telemedicine, performance expectancy can be viewed as the extent to which a new service route can assist patients in performing specific tasks related to healthcare services, such as conveniently communicating with doctors online, making electronic payments, and managing appointments. Therefore, it is reasonable to assume that performance expectancy would be critical in patients' decisions about service channels. Nevertheless, an insignificant relationship was found in the current investigation. This finding is similar to the work of Khatun et al. (2017).<sup>30</sup> They used the unified theory of acceptance and use of technology model to explain the end-user acceptance of MyOnlineClinic, an Australian telehealth service operating since 2015. However, the absence of a significant relationship does not mean that this variable should be excluded from further research: it may still prove to be a factor affecting intention to use.

Trust has been established as a critical antecedent to patient acceptance of telemedicine,<sup>31</sup> and it is related to the views of patients and healthy individuals on the practical value of storing health records electronically.<sup>32</sup> Numerous investigations have been conducted on the importance of trust in consumers' behaviors. It has been proposed that trust is an essential antecedent of their propensity to engage in activities of a collaborative nature.<sup>33</sup>

Consumers' intention to purchase products is affected by the "acceptable price level."<sup>34</sup> If product prices exceed what consumers deem acceptable, their intention to purchase the products declines. Many studies have indicated that the intention to use new technological applications and services is closely associated with what consumers consider a reasonable price, with lower prices more likely to entice them to take up the particular technology offered.<sup>35,36</sup>

Perceived usefulness is the term used to refer to the extent to which individuals consider the usage of a system to be likely to enhance their performance in a job. The perception of usefulness is vital in determining the degree of consumer adoption of innovations. This factor has been confirmed as key in earlier related studies. There is much evidence in support of the substantial effect that perceived usefulness has on consumers' adoption intentions.<sup>37-40</sup>

Perceived ease of use is the extent to which people consider that the actual usage of a new form of technology will be without effort.<sup>41</sup> If the technology fails to be easy to use and the user interface is complicated, they will have a negative attitude toward it. Conversely, technological applications that consumers perceive will be easier to operate than other applications have a higher probability

of being adopted.<sup>42</sup> The present investigation determined that perceived ease of use had the greatest influence on patients' intention to use the Siriraj Connect application.

Finally, previous studies reported that perceived ease of use affected attitudes and their intention to use mobile banking applications via perceived usefulness.<sup>43-46</sup> In the case of telemedicine, the easier it is to use a telemedicine service, the more valuable it is likely to be perceived by patients, and hence the greater the degree to which they will accept it. Patients are likely to perceive that they can easily use telemedicine if the service appears user-friendly and not complicated to use, they can recall how to use it, and the service is relatively free of hassles during use.

This study sought insight into factors influencing individuals' intention to use telemedicine during the COVID-19 pandemic. Given the results described above, it is suggested that factors related to patients' intention to use telemedicine should be considered when designing a system and developing the associated business model. Patients tend to use telemedicine when they perceive it is as easy to use and useful and if their surgeons have recommended it. Trust and price also influence patients' intentions. Future research should be broader focused and more complex to determine the influence of psychological expectations, performance expectations, and technical anxiety on telemedicine utilization.

Like any other research, this study has some limitations that must be acknowledged. First, it employed a cross-sectional design that investigated phenomena at 1 point in time. More specifically, the investigators explored patients' intention to use the Siriraj Connect telemedicine application among patients undergoing surgery when few hospital service options were available due to the COVID-19 pandemic. It would be expected that the results may differ in a normal situation when patients can visit the hospital and obtain the full benefits offered by face-to-face consultations with their doctors. Future researchers may investigate patients' behavior in the "next-normal," or postviral, to ensure that telemedicine remains a prominent part of the clinical enterprise. Doing so will provide a clearer picture of the factors influencing patients' intention to use Siriraj Connect. Second, this study was conducted at an academic medical center. Consequently, replicating the current research model at other hospital levels could produce different findings. Third, the research did not sufficiently sample the target groups by age, sex, educational level, or socioeconomic status. The scope of research was limited to patients who underwent surgery at Siriraj Hospital. Hence, future research could be extended to other patient groups because they may have different levels of digital health

literacy. Last, this research did not add all exogenous variables when examining patients' intention to use the Siriraj Connect telemedicine application. Therefore, the current research model could be extended with information system and service quality factors.

## CONCLUSION

Patients' intention to use telemedicine services mainly depends on their perceived ease of use and usefulness, and social influences on patients. The contributions of this study will enable developers, medical professionals, and marketers to improve telemedicine services to better satisfy patients undergoing surgery and increase their intention to use telemedicine. As patients think the most important aspect of telemedicine services is their ease of use, online services should be designed to be user friendly, with all relevant information and resources readily accessible. Moreover, patients expect telemedicine services to be useful and available at a reasonable price. To encourage patients to try online services, information should be provided by hospital surgeons and public relations department staff. Further study should investigate other potentially relevant factors impacting telemedicine services' uptake and continued use. Among these are the attitude of surgeons and healthcare providers toward online services, the stability of telemedicine platforms, and legal considerations related to providing personal health details online.

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