Original Article

Exploring physicians' expectations of telehealth services implementation in primary care: An application of the social cognitive theory

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Abstract

Background: Understanding healthcare professionals' expectations in telehealth is crucial for successful implementation. The present study used an adaptation of the antecedents-expectations model, supported by the social cognitive theory to evaluate physicians' expectations regarding the implementation of telehealth in primary healthcare (PHC) and to investigate the potential influence, on expectations, of a prior telehealth experience (antecedents) during the Coronavirus disease 2019 (COVID-19) pandemic. **Materials and Methods:** A questionnaire-based survey was conducted online, targeting PHC physicians. Expectations covered four telehealth performance domains including public health and health promotion, Care Quality and Workflow Organization, Patient's Convenience and Engagement and Providers' Value and Training. Antecedents included six domains including gain in self-efficacy, gain in knowledge, gain in participation/engagement, gain in experience, enjoyment and satisfaction. Stepwise linear regression was performed to analyse the effect of antecedents on overall expectations. **Results:** A total of 54 physicians participated in the study. The mean expectation score was 114.15/154 (SD = 28.26), with highest expectations concerning cost-effectiveness, care timeliness and patients' convenience. A previous experience with smart apps and dedicated telehealth platforms was associated with lower expectations scores. Expectations scores were positively correlated with antecedents scores; however, satisfaction was the sole independent factor of overall expectations (regression coefficient B = 4.40, 95%CI: 3.11–5.68). **Conclusion:** The findings highlight the significance of previous experience and various antecedents in shaping physicians' expectations about telehealth. These insights can inform the development of strategies and interventions to enhance healthcare professionals' expectations and facilitate the successful implementation of telehealth services.

Keywords: COVID-19, physicians, primary care, satisfaction, self-efficacy, social cognitive theory, telehealth

Introduction

The ongoing Saudi healthcare transformation has enabled remarkable achievements in primary healthcare (PHC) indicators.[1] Yet, concerns rise about the expanding role of PHC, encompassing the management of more complex conditions,[2,3] and the subsequent effects on the effectiveness and sustainability of the new care model. In such a context, telehealth represents one of the solutions.[4-6]

Alongside the tangible advancements in telehealth,[7,8] the Coronavirus disease 2019 (COVID-19) crisis positively impacted the Saudi telehealth experience, advancing the implementation of e-health applications and enhancing patient satisfaction, provider efficiency and cost-effectiveness.[9,10] In PHC setting, preliminary research indicated positive telehealth acceptance and satisfaction among providers.[11,12] However, it remains uncertain how the COVID-19 experience has shaped healthcare providers' expectations of telehealth within the PHC setting.

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This study analysed how physicians' prior telehealth experience during the COVID-19 pandemic influenced their expectations for its implementation in PHC.

Materials and Methods

Design participants

A cross-sectional study was conducted at the PHC centres affiliated to the University of Jeddah, Saudi Arabia, between March and July 2022. It targeted all 67 physicians and residents working or training in the participating PHCs. A convenience sampling was used to include all eligible and consenting physicians. The study protocol was approved by the institutional review board of the University of Jeddah (ref#HAP-02-J-094).

Conceptual framework and hypotheses

The study used an adaptation of the antecedents–expectations model, supported by the social cognitive theory (SCT),[10,11] to test whether the physicians' experience in telemedicine during COVID-19 (antecedents) could determine their expectations about telehealth implementation in PHC. Box 1 and Supplemental Figure 1 outline the conceptual framework, including the main variables, their respective definitions, and the related hypotheses that were tested in accordance with the adaptation of the SCT model and beyond.

Data collection

A structured questionnaire was designed by author, based on a thorough literature review, consisting of three parts:

- Part A collected participants' demographic and professional characteristics, in addition to previous experience with telehealth media.
- Part B explored antecedents, including experience gained in telemedicine services during the COVID-19 crisis. It consisted of 24 items rated on a seven-point Likert-type agreement scale and categorized into six dimensions: gain in self-efficacy, gain in knowledge, gain in participation/engagement, gain in experience, enjoyment and satisfaction.
- Part C assessed participants' expectations by rating their level of agreement (on a seven-point Likert-type scale) with 22 statements related to the expected outcomes of telemedicine implementation in PHC. The statements covered aspects such as equitable and easy access to care, improving care-seeking behaviour and patient acceptability, etc., and were divided into four dimensions: public health and health promotion (PHHP), Care Quality and Workflow Organization (CQWO), Patient's Convenience and Engagement (PCE) and Providers' Value and Training (PVT).

Questionnaire validation

The questionnaire underwent face and content validation by the authors and a methodologist. The reliability of the

Box 1: Definitions and hypotheses of the study model with reference to the original model by Lankton and Wilson[19]

Variable (type)	Model	Definition: Construct	Hypothesis
Expectations (Outcome)	SCT and beyond	Prediction or anticipated judgment regarding the future performance of telehealth in primary healthcare (PHC). Assessed across four dimensions of healthcare.	Physicians have varying levels of expectations towards telehealth implementation in PHC, with expectations differing among the dimensions of healthcare.
Gain in self-efficacy (Explanatory)	SCT	Physicians' assessment of their own capabilities to effectively use telehealth for their patients following their experience during the COVID-19 crisis.	H1: High perceived self-efficacy will positively influence expectations of telehealth in PHC.
Gain in knowledge (Explanatory)	SCT	Level of familiarity and expertise acquired through experience in telehealth during the COVID-19 crisis.	H2: Positive gain of knowledge during the COVID-19 crisis will positively influence expectations about telehealth in PHC.
Gain in participation (Explanatory)	SCT	Level of engagement and critical judgment acquired towards issues related to telehealth in a care setting.	H3: Gain in engagement will positively influence expectations.
Experience in telehealth applications during the COVID-19 crisis (Explanatory)	SCT	Degree to which physicians have utilized telehealth technology for various care-related tasks.	H4: Positive gain of experience during the COVID-19 crisis will positively influence expectations.
Enjoyment (Explanatory)	SCT	Perception that the use of telehealth technology during the COVID-19 crisis was pleasant and intrinsically enjoyable.	H5: Higher levels of enjoyability during the COVID-19 crisis will positively influence expectations.
Satisfaction (Explanatory)	SCT	Perception that the performance of telehealth during the COVID-19 crisis met expectations for medical care delivery.	H6: Prior satisfaction from experience in telehealth during the COVID-19 crisis will positively influence expectations.
Demographic factors (Explanatory)	Beyond SCT	Age, gender, marital status, etc.	H7: Expectations of telehealth implementation in PHC are influenced by demographic factors.
Professional factors (Explanatory)	Beyond SCT	Years of practice, specialty, academic level, etc.	H8: Expectations of telehealth implementation in PHC are influenced by professional factors.

SCT: Social cognitive theory

'antecedents' and 'expectations' scales and subscales was analysed using Cronbach's alpha. The construct validity of the 'expectations' scale was assessed using principal component analysis (PCA) with Varimax rotation. Additionally, we evaluated the appropriateness of the dataset for factor analysis using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. The initial criteria for item extraction involved considering eigenvalues ≥ 1 and extraction values above 0.5. After the initial extraction, we analysed the Scree plot and compared the calculated eigenvalues with those obtained from Monte Carlo PCA for parallel analysis, with 100 replications. Following this, we conducted a second extraction, fixing the number of factors at three, and performed a final extraction by excluding the unloaded items.

Procedure

The questionnaire was adapted for online administration using Google Sheets. The survey link was disseminated to all physicians working at the participating PHC, via professional groups in social media and emails. Several reminders were sent regularly to prompt participation.

Statistical methods

Statistical analysis was performed with the Statistical Package for Social Sciences version 21.0 for Windows (SPSS Inc., Chicago, IL, USA). Independent *t*-test and one-way analysis of variance (ANOVA) tests were used to analyse the association of 'expectations' scores with the explored demographic and professional factors. The association between 'expectations' and 'antecedents' domains was analysed using Pearson's correlation and linear regression. Stepwise linear regression was used to analyse 'antecedents' as the independent factors of overall 'expectations' score. A *P* value of <0.05 was considered statistically significant.

Results

Reliability analysis

The 'antecedents' scale (mean population's score = 115.77/168) exhibited excellent reliability with a Cronbach's alpha of 0.964, indicating strong consistency among its 24 items, and its subscales showed coefficients ranging from 0.830 to 0.934. Similarly, 'expectations' scale (mean score = 114.15/154) showed high reliability (Cronbach's alpha = 0.973), and its subscales exhibited satisfactory Cronbach's alpha coefficients ranging from 0.886 to 0.944 [Table 1].

Table 1: Reliability analysis of the scales and subscales

Scale/subscale	*n*	No. items	Cronbach's alpha	Mean	SD	Theoretical range
Antecedents	43	24	0.964	115.77	28.48	24–168
Gain in self-efficacy	43	4	0.876	20.35	6.06	4–28
Gain in knowledge	43	4	0.934	18.98	6.01	4–28
Gain in engagement	43	4	0.862	19.72	5.39	4–28
Gain in experience	43	4	0.870	18.77	5.26	4–28
Enjoyment	43	4	0.830	17.88	5.23	4–28
Satisfaction	43	4	0.921	20.07	5.21	4–28
Expectations	54	22	0.973	114.15	28.26	22–154
PHHP	54	5	0.886	27.13	6.41	7–35
CQWO	54	5	0.904	26.43	6.42	7–35
PCE	54	6	0.917	31.74	7.63	7–42
PVT	54	6	0.944	28.85	9.59	7–42

PHHP=Public Health and Health Promotion, CQWO=Care Quality and Workflow Organization, PCE=Patient's Convenience and Engagement, PVT=Providers' Value and Training

Demographic and professional data

We received 54 complete questionnaires among 67 eligible PHC physicians (response rate = 80%). The majority of participants were male (77.8%), predominantly (68.5%) aged 20–39 years. The largest group (44.4%) had 5–10 years of experience, followed by those with more than 10 years of experience (31.5%). The participants consisted of specialists (51.9%), consultants (31.5%), and residents (16.7%). The majority reported seeing less than 20 patients per day (81.5%) and the most common consultation time was 10–20 min (66.7%) [Table 2].

Experience in telehealth

The most frequently used telehealth media was phone calls (75.9%), followed by social media platforms such as WhatsApp (53.7%), videoconferencing (31.5%), smart applications like Sehhati (46.3%) and dedicated platforms (25.9%). Among the participants, 48.1% reported having their first telemedicine experience before the COVID-19 crisis, while 31.5% reported a first experience during the COVID-19 crisis, whereas the remaining 20.4% reported no prior experience [Table 2].

Expectations for telehealth performance by care aspect and domain

Figure 1 presents the expectations of PHC physicians regarding the performance of telehealth in primary care. The highest mean score (5.7/7) was observed for 'reducing the economic cost of healthcare'; followed by 'enhancing timeliness of care' and 'more convenient and comfortable care process for patients' with mean scores of 5.6 and 5.5, respectively. On the contrary, the lowest mean scores were observed for items related to physicians' confidence in clinical decisions (4.6), skills and continuous education (4.7) and charisma and social role (4.7).

In terms of variability, the standard deviation values provide insight into the dispersion of responses within each care aspect. Notable variations were observed for 'better physician-patient relationship in PHC' (SD = 1.8), 'enhancing clinical skills and continuous education of physicians' (SD = 2.0) and 'more clinical training opportunities in PHC' (SD = 1.8).

Construct validity of the 'expectations' scale

The KMO value was 0.90, indicating that the dataset was suitable for PCA and factor analysis. Additionally, Bartlett's test yielded a significant result ($P < 0.001$), further supporting the appropriateness of PCA. The extraction process identified three components with eigenvalues >1, accounting for 64.8,

Table 2: Demographic and professional data

Parameter	Level	Frequency	Percentage
Gender	Male	42	77.8
	Female	12	22.2
Age (years)	20–39	37	68.5
	40 and older	17	31.5
Marital status	Single	7	13.0
	Married	42	77.8
	Divorced	5	9.3
Nationality	Saudi	49	90.7
	Non-Saudi	5	9.3
Number of children	None	13	24.1
	1–2	20	37.0
	3+	21	38.9
Professional data			
Years of practice	0–5 years	13	24.1
	5–10 years	24	44.4
	10–15 years	12	22.2
	>15 years	5	9.3
Speciality	General practitioner	9	16.7
	Internal medicine or endocrinology	5	9.3
	Paediatrics	2	3.7
	Family medicine	9	16.7
	Other specialities	29	53.7
Position	Resident	9	16.7
	Specialist	28	51.9
	Consultant	17	31.5
Academic degree	Fellowship	20	37.0
	Bachelors	7	13.0
	Masters	5	9.3
	PhD	22	40.7
Average daily patient flow	<20 patients	44	81.5
	20–40 patients	8	14.8
	>40 patients	2	3.7
Average consultation time	<10 min	13	24.1
	10–20 min	36	66.7
	>20 min	5	9.3
Telehealth media used	Phone call	41	75.9
	Social media (WhatsApp, etc.)	29	53.7
	Videoconference	17	31.5
	Smart application (Sehhati etc.)	25	46.3
	Dedicated telehealth platform	14	25.9
	Other	7	13.0
First experience in telemedicine	Before COVID-19 crisis	26	48.1
	During COVID-19 crisis	17	31.5
	No experience	11	20.4

9.3 and 5.8% of the total variance, respectively (cumulative percentage = 80.0%). Based on the Monte Carlo PCA for parallel analysis, component one was retained, while components two and three were rejected. Furthermore, the analysis of the Scree plot revealed an 'Elbow Break' pattern at component two, supporting the one-dimensionality of the scale. Examining the component loadings, all 22 items exhibited high loading values (ranging from 0.650 to 0.892) in component one, except for the item 'equitable and easy access to care', which displayed a higher loading value in component two (0.657 vs. 0.650) compared to component one, respectively.

Association between telemedicine expectations and demographic and professional factors

Although none of the associations reached statistical significance, some findings were worth noting. Females ($P = 0.099$), participants aged 40 and older ($P = 0.185$) and non-Saudis ($P = 0.0124$) had relatively lower mean

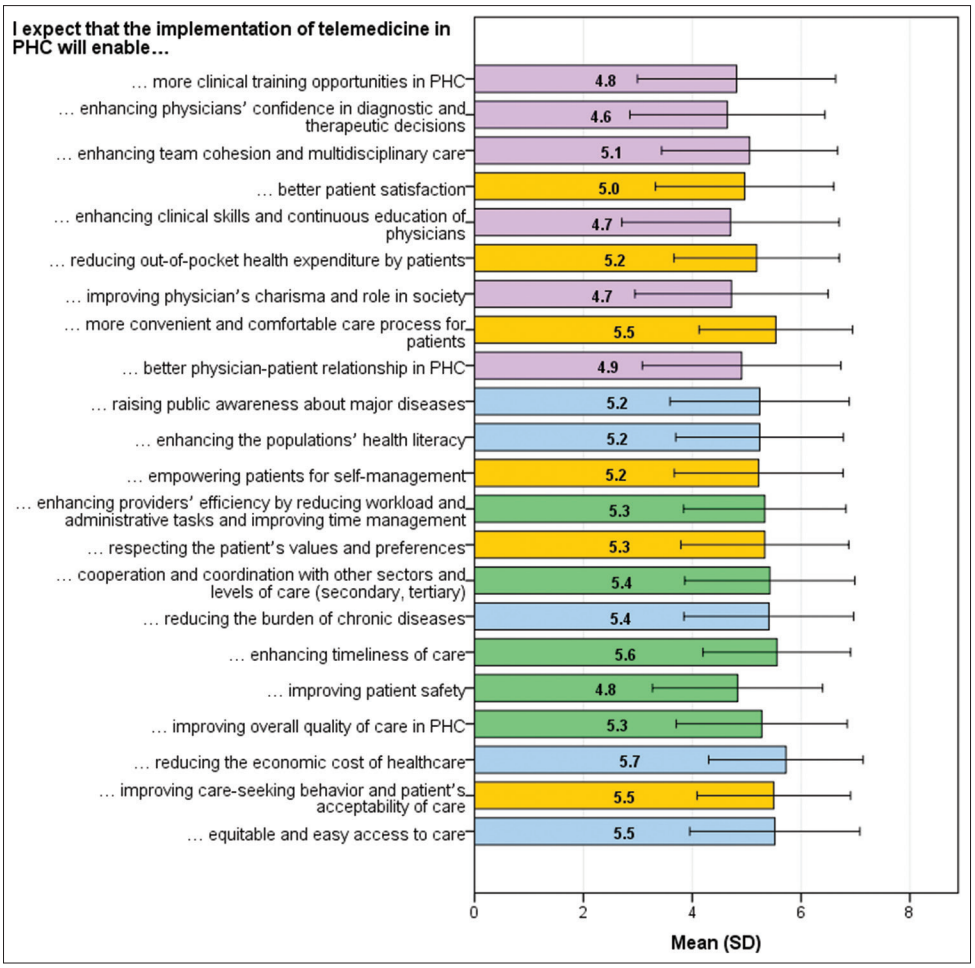

Figure 1: Bar length represents the mean level of agreement and colours represent the domain of care including Public Health and Health Promotion (PHHP, blue); Care Quality and Workflow Organization (CQWO, green); Patient's Convenience and Engagement (CQWO, orange) and Providers' Value and Training (PVT, purple).

Table 3: Association of telemedicine expectation with demographic factors

Factor	Level	Mean	SD	*P*
Gender	Male	117.55	27.21	
	Female	102.25	29.84	0.099
Age (years)	20–39	117.62	26.68	
	40 and older	106.59	30.91	0.185
Marital status	Single	104.00	40.12	
	Married	116.76	26.81	
	Divorced	106.40	21.80	0.449
Nationality	Saudi	116.04	26.37	
	Non-Saudi	95.60	42.03	0.124
Number of children	None	108.54	32.63	
	1–2	120.30	22.30	
	3+	111.76	30.68	0.455

expectation scores compared to their counterparts [Table 3]. None of the professional factors demonstrated significant or notable results [Table 4].

Previous experience in telehealth technology use showed two significant associations. Participants who reported experience with smart apps for telehealth (104.92 vs. 122.10, $P = 0.024$) and dedicated telehealth platforms (99.57 vs. 119.25, $P = 0.023$) had significantly lower expectation scores compared to those who had no such experience. No significant association was found between telemedicine expectations and the timing of the first experience in telemedicine (before or during the COVID-19 crisis) [Table 5].

Correlation of expectations with antecedents

Significant positive correlations were found between telemedicine expectations in all performance domains (PHHP, CQWO, PCE, PVT) and the antecedents of telehealth technology use, including gain in self-efficacy, gain in knowledge, gain in engagement, gain in expertise, enjoyment, satisfaction and overall antecedents. The correlations ranged from 0.48** to 0.76**, indicating moderate to strong positive relationships between these variables [Table 6].

Additionally, the correlations between different 'expectation' domains were consistently high, ranging from 0.73 to 0.97, indicating strong positive relationships. This suggests

Table 4: Association of telemedicine expectation with professional factors

Factor	Level	Mean	SD	*P*
Years of practice	0–5 years	110.54	31.47	
	5–10 years	117.75	25.12	
	10–15 years	114.50	23.79	
	>15 years	105.40	47.01	0.791
Specialty	General practitioner	100.44	34.28	
	Inter. med. or endocrinology	119.40	24.98	
	Paediatrics	119.00	1.41	
	Family medicine	116.89	41.03	
	Other specialities	116.31	23.06	0.642
Position	Resident	99.89	31.13	
	Specialist	116.75	30.17	
	Consultant	117.41	22.08	0.256
Academic degree	Fellowship	117.95	26.78	
	Bachelors	104.86	37.96	
	Masters	105.00	8.43	
	PhD	115.73	29.61	0.646
Average daily patient flow	<20 patients	114.20	27.05	
	20–40 patients	115.50	39.18	
	>40 patients	107.50	3.54	0.940
Average consultation time	<10 min	98.77	31.84	
	10–20 min	120.25	26.29	
	>20 min	110.20	19.16	0.057

Table 5: Association of telemedicine expectation with previous experience in telehealth technology use

Factor	Level	Mean	SD	*P*
Phone call	No	116.62	16.55	
	Yes	113.37	31.20	0.722
Social media (WhatsApp, etc.)	No	117.72	21.14	
	Yes	111.07	33.28	0.394
Videoconference	No	117.81	23.44	
	Yes	106.18	36.20	0.162
Smart Apps (Sehhati etc.)	No	122.10	19.27	
	Yes	104.92	34.14	0.024*
Dedicated telehealth platform	No	119.25	20.31	
	Yes	99.57	41.34	0.023*
Other	No	115.13	28.08	
	Yes	107.57	30.86	0.514
First experience in telemedicine	Before COVID-19 crisis	109.46	33.08	
	During COVID-19 crisis	119.65	27.98	
	No experience	116.73	11.34	0.493

*Statistically significant result (P<0.050)

that the 'expectations' scale demonstrates good internal validity, as the expected performance in one care area is highly correlated with the expected performance in other care areas [Table 6].

Effect of antecedents on expectations

In the univariate model, all antecedents including gain in self-efficacy, gain in knowledge, gain in engagement, gain in expertise, enjoyment and satisfaction were found to have a significant positive effect on overall expectations. The regression coefficients (B) ranged from 2.87 to 4.40, with P values <0.001 or < 0.002. In the stepwise multivariate model, only satisfaction remained as a significant predictor of overall expectations, with B = 4.40 (95% CI: 3.11–5.68; P value <0.001). The multivariate model explained 54% of the variance in the outcome (R^2 = 0.538) [Table 7, Figure 2].

Discussion

Summary of the findings

This study utilized the SCT to investigate the expectations of PHC physicians regarding telehealth implementation and to explore the impact of various antecedents on these expectations, using a specifically designed scale for this purpose. The reliability analysis of the study scales and subscales revealed high internal consistency, and the construct validity analysis confirmed the one-dimensionality of the expectations scale. The 54 participants had high expectations for telehealth in terms of reducing economic costs, enhancing timeliness of care, and providing more convenient and comfortable care processes for patients. Demographic and professional factors showed no significant effect, while previous experience with specific telehealth technologies negatively influenced expectations. On the contrary, telemedicine expectations showed significant positive correlations with antecedents. More particularly, satisfaction with previous telehealth use emerged as a strong predictor of overall expectations [Figure 2].

Application of the SCT

In the context of the present study, SCT was applied to analyse and understand the factors that influence physicians' acceptance and engagement based on prior experience. The core concept of SCT, first introduced by the psychologist Albert Bandura in 1986,[15] refers to the interplay between the individuals' cognition and social experiences, and how this determines the active observational learning. The theory suggests that human actions are determined by their perceived anticipated impact, which in turn depends on the antecedents, alongside other constructs such as the perceived self-efficacy, goals and self-evaluation.[14,16] Aligned with this concept, the study hypothesized that PHC physicians' antecedents of telehealth use, notably during COVID-19, would impact their own self-effectiveness and expectations of its implementation in the PHC setting. Several authors used SCT to examine the factors that influence perception of telehealth by healthcare professionals[17] or patients.[18,19]

Telehealth expectations within the SCT framework: According to the SCT principles, a physician with previous disappointing experiences will develop negative expectations and conclusions of self-ineffectiveness regarding telehealth. On the contrary, a physician with positive expectations is the one who likely had a prior successful experience that enabled him to gain self-efficacy and motivated him for future use of telehealth. The theory principle is confirmed by our study, as we observed a significant

Table 6: Correlation of telemedicine expectation in the four performance domains with antecedents.

Antecedent	Expectation by performance domain				
	PHHP	CQWO	PCE	PVT	Overall
Correlation between 'expectations' and 'antecedents'					
Gain in self-efficacy	0.76**	0.65**	0.72**	0.53**	0.69**
Gain in knowledge	0.53**	0.61**	0.56**	0.50**	0.571**
Gain in engagement	0.48**	0.56**	0.47**	0.42**	0.50**
Gain in expertise	0.51**	0.54**	0.49**	0.39*	0.50**
Enjoyment	0.67**	0.64**	0.65**	0.59**	0.67**
Satisfaction	0.76**	0.68**	0.75**	0.62**	0.73**
Overall antecedents	0.72**	0.72**	0.71**	0.59**	0.71**
Internal validity					
PHHP	-	0.89**	0.92**	0.73**	0.93**
CQWO	0.89**	-	0.89**	0.81**	0.95**
PCE	0.92**	0.89**	-	0.85**	0.97**
PVT	0.73**	0.81**	0.85**	-	0.92**
Overall	0.93**	0.95**	0.97**	0.92**	-

Values are Pearson's correlation coefficient (*r*). Statistical significance: *P<0.05; **P<0.001. PHHP=Public Health and Health Promotion; CQWO=Care Quality and Workflow Organization; PCE=Patient's Convenience and Engagement; PVT=Providers' Value and Training

Table 7: Effect of telehealth use antecedents on overall expectation among primary healthcare physicians, in application of the social cognitive theory (SCT) (Linear regression)

Predictor (Antecedents)	Univariate model				Stepwise multivariate model			
	B	95% CI		*P*	*B*	95% CI		*P*
Gain in self-efficacy	3.54	2.36	4.72	<0.001*	*Ex.*	-	-	0.256
Gain in knowledge	2.87	1.62	4.31	<0.001*	*Ex.*	-	-	0.227
Gain in engagement	2.90	1.32	4.48	0.001*	*Ex.*	-	-	0.623
Gain in expertise	2.95	1.33	4.57	0.001*	*Ex.*	-	-	0.342
Enjoyment	3.97	2.57	5.38	<0.001*	*Ex.*	-	-	0.226
Satisfaction	4.40	3.11	5.68	<0.002*	4.40	3.11	5.68	<0.001*

B: Unstandardized regression coefficient; *Ex.*: Variable excluded from the model; the multivariate model explains 54% of the outcome variance (R^2=0.538). Statistical significance: *P<0.05

correlation between antecedents of telehealth use and the physicians' expectations. This is demonstrated by significant positive linear relationships between antecedents scores, including the six constructs, and overall expectation score, with regression coefficients (*B*) ranging from 2.87 to 4.40.

More specifically, gain in self-efficacy in antecedents showed a high regression coefficient of 3.54. In the SCT model, self-efficacy and outcome expectancies are tightly linked by a bi-directional relationship. This interaction determines the individual's behaviour, which is in our case the adoption of telehealth technology.[15] The same bi-directional interaction exists between outcome expectation and other cognitive factors usually acquired in prior experiences (or by observational learning) such as knowledge and expertise, enjoyment and satisfaction, and engagement, leading to anticipated reward perception. Consistently with our findings, Tsai showed that physicians' self-efficacy in telemedicine technologies was the main antecedent of perceived ease of use.[17] Another systematic review identified self-efficacy as one of the crucial factors for accepting telemedicine by doctors.[20] Moreover, by using the SCT to explore factors influencing expectations of e-health services among patients, Lankton *et al.* found that self-efficacy, antecedents of past experiences (participation, knowledge and internet experience) and affective factors (prior satisfaction and enjoyment) highly impacted the participants' expectations.[13]

Furthermore, satisfaction from previous use of telehealth technology was the strongest predictor of positive expectations by physicians. Similarly, in a cross-sectional study, Kissi *et al.* found that the perceived ease of use and perceived usefulness were essential determinants of telehealth satisfaction among physicians,[21] denoting the bidirectional relationship between satisfaction and attitudes. Therefore, providers' satisfaction with telehealth systems could be considered the culminant outcome to be considered when designing and launching a new technology designed for healthcare professionals.

Factors beyond the SCT

Sociodemographic and professional factors can also impact the intentions to use telemedicine among doctors. Our study showed lower means of expectation scores in females, older age groups and non-Saudi physicians; however, none of these factors reached statistical significance. On the contrary, the absence of statistical significance may be due to the low statistical power resulting from the sample size. In his study, Tsai found that older residents had overall positive perceptions towards the telehealth system compared with their counterparts.[17] The type of speciality also seems to have an important contribution to the predisposition to use telemedicine in the future. Hence, a recent cross-sectional study conducted during the COVID-19 pandemic showed that physicians' satisfaction regarding the use of telemedicine varied greatly with the speciality. Furthermore, psychiatrists had the highest use and willingness to use telehealth, whereas surgeons were the less involved. The study also noted differences in the ability to perform healthcare tasks such as physical examination and treatment prescription among specialties, using telehealth.[22] Therefore, recognizing and addressing the diverse needs and readiness levels among different demographic groups and specialities is crucial for the successful implementation and enhancement of telehealth in PHC. Tailored training programmes and speciality-specific strategies can facilitate better adoption and more effective utilization of telehealth services.

Implications for practice and interventions

The findings of this study suggest that the principles of SCT can be employed to enhance the acceptance of telehealth by PHC practitioners and increase their expectations regarding the utility of this technology. In accordance with SCT, self-efficacy can be developed through four methods.[23] Applied to telehealth, these can be articulated as follows:

(i) *Successful personal experiences*: physicians' self-efficacy and satisfaction can be boosted by being assisted to succeed in performing telehealth tasks.

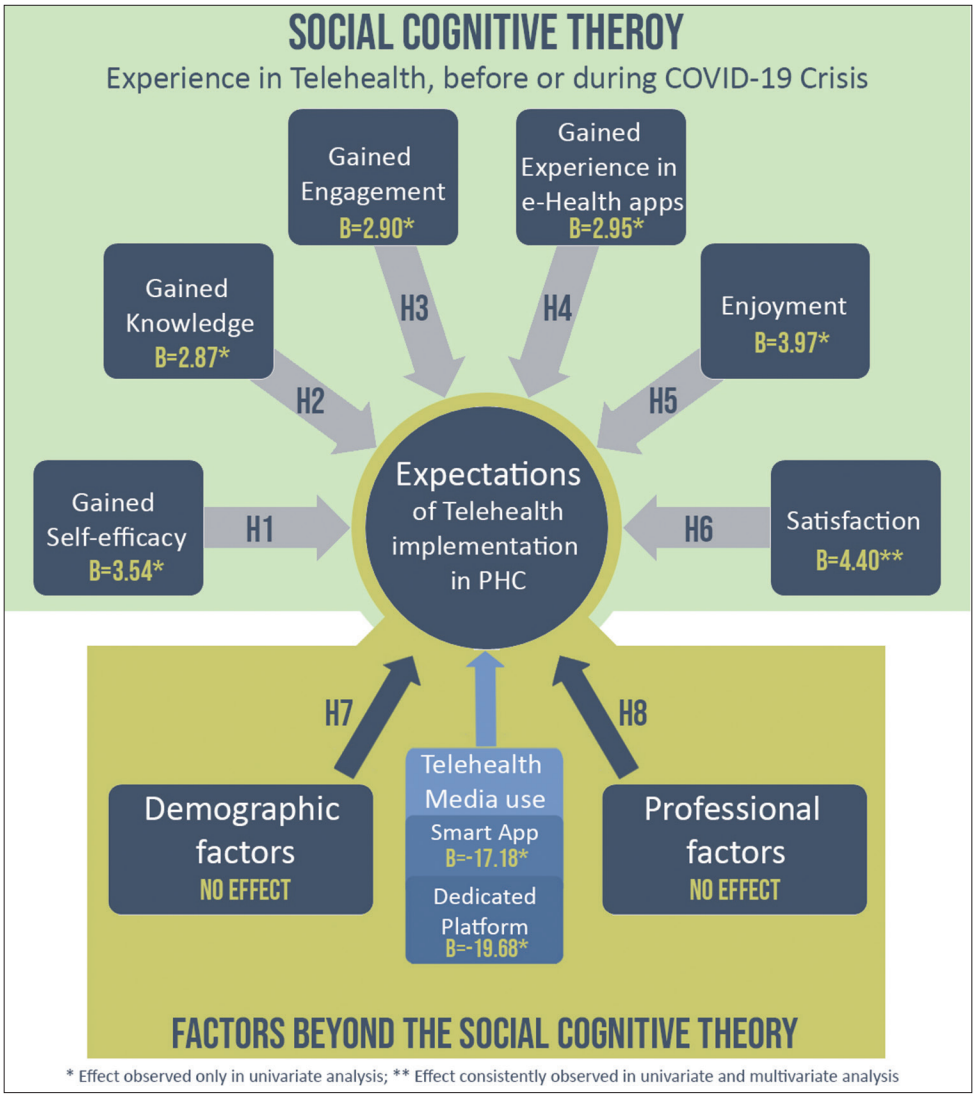

Figure 2: Results of the social cognitive theory (SCT) application to explore physicians' expectations about the implementation of telehealth in primary healthcare (PHC), as explained by the antecedents and other factors beyond the SCT model

(ii) *Social modelling*: physicians' self-efficacy can be promoted by their peers (e.g. same age, and same speciality) who can perform/acquire telehealth tasks.

(iii) *Physical and emotional experience improvement*: when creating telehealth technologies/applications, it is crucial to ensure the easiness of use, which would optimize both the physical and affective experience among physicians, leading to a gain in self-efficacy.

(iv) *Verbal persuasion*: doctors with low expectations of telehealth can be encouraged by others especially their colleagues with higher self-efficacy, to boost their confidence and acceptance of this technology. Additionally, physicians may benefit from educative programs to enhance their knowledge and expertise in telehealth technologies.

Strengths and limitations

While the study was mainly limited by its cross-sectional nature and the low sample size, its strength comes from its unique implication of the SCT principles in evaluating the complex interplay between cognitive, behavioural and environmental factors with telehealth acceptance and intentions among PHC physicians. However, one key point to consider is that the study was conducted during the COVID-19 pandemic, during which telehealth use was more of an imposed reality than a desired or optional choice. This may bias the estimation of the actual physicians' engagement in telemedicine under normal circumstances.

Future research directions

Future research is needed to explore the factors that determine the predisposition to accepting telehealth among physicians using the SCT concepts, notably after implementation in PHC. Such studies may focus on understanding the relationship between expectations and satisfaction, and the interaction of the environmental and technical barriers and facilitators to telehealth adoption. This will enable continuous improvement of the design and ergonomics of the used systems while designing effective interventions to enhance self-efficacy and engagement in telehealth technology.

Conclusion

This application of the SCT framework showed high expectations among physicians regarding telehealth implementation in PHC, particularly in terms of cost reduction, care timeliness, and convenience for patients. However, previous experience with telehealth technologies was associated with lower expectations, highlighting the need for technology improvements to enhance first-use experiences. Further antecedents' analysis showed that perceived gains in self-efficacy, knowledge, engagement, expertise, and enjoyment from prior experiences, besides satisfaction, were positively correlated with expectations. These insights have implications for developing interventions and strategies to enhance healthcare professionals' experiences and expectations and promote successful telehealth implementation. Further research should explore interventions to enhance providers' engagement and self-efficacy in telehealth to promote successful implementation in PHCs.

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Conflicts of interest

There are no conflicts of interest.

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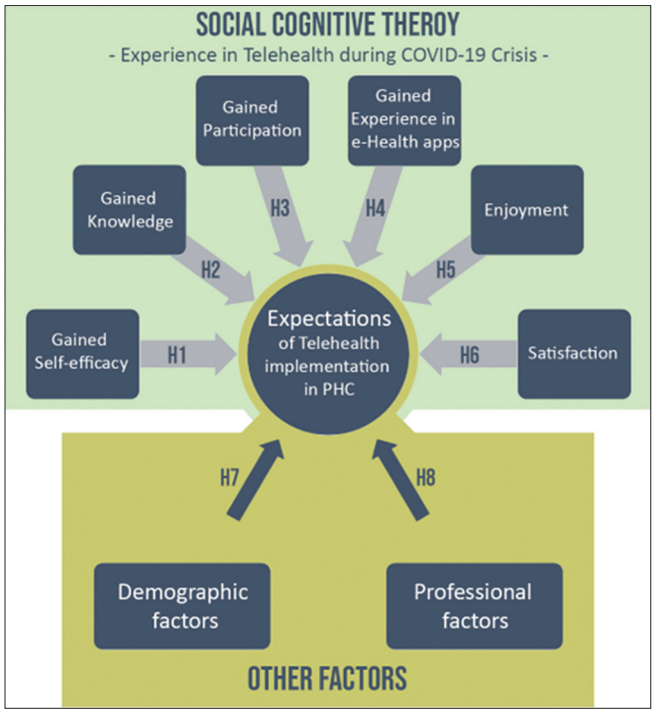

Supplemental Figure 1: Application of the social cognitive theory (SCT) to explore physicians' expectations about the implementation of telehealth services in primary healthcare (PHC), as explained by prior experience in telehealth (antecedents) and other factors beyond SCT: Study hypotheses

Acknowledgements: **[Supplementary Material]**

Name	Role
Mohamed Amine Haireche	Statistical advice and editing

Source (s) of support: None

Conflicting Interest (If present, give more details): None

Contribution Details:

Enter the role of contributors in the first column and names of the contributors in the columns 2, 3, and so on.

Role (Concepts, Design, Definition of intellectual content, investigation, manuscript writing, etc.)	Contributor 1	Contributor 2	Contributor 3	Contributor 4
Questionnaire writing	*			
Manuscript writing	*			
Design the study	*			

Ethical policy and Institutional Review Board statement: The study protocol was approved by the institutional review board of the University of Jeddah (ref#HAP-02-J-094). All participants were informed of their rights to voluntary participation in this study, with respect to the principles of autonomy, confidentiality, and nonmaleficence.

Patient declaration of consent statement: Not applicable.

Data availability statement: The data set used in the current study is available (tick the appropriate option and fill in the information)

- repository name

_____

- name of the public domain resources

_____

- data availability within the article or its supplementary materials

_____

☑ **available on request from (contact name/email id)**

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- dataset can be made available after the embargo period due to commercial restrictions

_____

Reporting guidelines: The present article adheres to STROBE reporting guidelines for observational studies.

Reporting guidelines for Original Research Articles (Case–control, Cohort and Cross-sectional studies): STROBE (2007).

STROBE Statement – checklist of items that should be included in reports of observational studies

	Item no.	Recommendation	Check
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	☑
		Introduction	
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	☑
Objectives	3	State-specific objectives, including any prespecified hypotheses	☑
		Methods	
Study design	4	Present key elements of study design early in the paper	☑
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	☑
Participants	6	(a) *Cohort study* – Give the eligibility criteria and the sources and methods of selection of participants. Describe methods of follow-up Case–control study – Give the eligibility criteria and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls Cross-sectional study – Give the eligibility criteria and the sources and methods of selection of participants	☑
		(*b*) *Cohort study* – For matched studies, give matching criteria and number of exposed and unexposed Case–control study – For matched studies, give matching criteria and the number of controls per case	NA
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	☑
Data sources/measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	☑
Bias	9	Describe any efforts to address potential sources of bias	NA
Study size	10	Explain how the study size was arrived at	☑
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	☑
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	☑
		(*b*) Describe any methods used to examine subgroups and interactions	☑
		(*c*) Explain how missing data were addressed	NA
		(*d*) *Cohort study* – If applicable, explain how loss to follow-up was addressed *Case–control study* – If applicable, explain how matching of cases and controls was addressed *Cross-sectional study* – If applicable, describe analytical methods taking account of sampling strategy	☑
		(*e*) Describe any sensitivity analyses	
		Results	
Participants	13*	(*a*) Report numbers of individuals at each stage of study – e.g., numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up and analysed	☑
		(*b*) Give reasons for non-participation at each stage	NA
		(*c*) Consider use of a flow diagram	NA
Descriptive data	14*	(*a*) Give characteristics of study participants (e.g. demographic, clinical, social) and information on exposures and potential confounders	☑
		(*b*) Indicate the number of participants with missing data for each variable of interest	NA
		© *Cohort study* – Summarise follow-up time (e.g. average and total amount)	NA
Outcome data	15*	*Cohort study* – Report numbers of outcome events or summary measures over time	NA
		Case–control study – Report numbers in each exposure category, or summary measures of exposure	NA
		Cross-sectional study – Report numbers of outcome events or summary measures	☑
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g 95% confidence interval). Make clear which confounders were adjusted for and why they were included	☑
		(*b*) Report category boundaries when continuous variables were categorized	NA
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done – e.g., analyses of subgroups and interactions, and sensitivity analyses	☑

Contd...

	Item no.	Recommendation	Check
		Discussion	
Key results	18	Summarize key results with reference to study objectives	☑
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	☑
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	☑
Generalizability	21	Discuss the generalizability (external validity) of the study results	☑
		Other information	
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	NA