

Factors Influencing Willingness to Pay for Tele dermatology among Patients with Psoriasis

Thanachat Rutnumnoi, M.D.,^{id} Chayada Chaiyabutr, M.D.,^{id} Narumol Silpa-archa, M.D.,^{id} Chanisada Wongpraparut, M.D.,^{id} Leena Chularojanamontri,^{id} M.D.

Department of Dermatology, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand.

ABSTRACT

Objective: To determine the proportion of patients with psoriasis prepared to pay for TD. Attitudes and factors influencing their willingness to pay (WTP) were evaluated.

Materials and Methods: This cross-sectional study was conducted from July 2020 to October 2021. Adult patients with psoriasis completed a 2-page self-administered questionnaire.

Results: Of 200 patients, 133 (66.5%) were unfamiliar with TD. However, 144 (72%) were prepared to pay for TD if it were introduced. The majority of patients answered that 300 Bath was the maximum price that they were willing to pay for TD service. Compared with traditional in-person visits, the significant positive influencing factors on WTP were TD's quicker delivery of treatment, lower costs, and non-inferiority to usual care. Multivariate analysis showed that the independent factors for WTP were higher educational levels, elimination of out-of-pocket, in-hospital visit expenses, owning a business, TD options suited to psoriasis, and no adverse effects on the patient-doctor relationship.

Conclusion: Knowing patients' attitudes toward TD and the factors influencing their WTP is essential for developing efficient services. Data from this study can be used to develop successful TD services for patients with psoriasis.

Keywords: Psoriasis; Tele dermatology; Telemedicine; Willingness to pay (Siriraj Med J 2022; 74: 731-738)

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INTRODUCTION

Psoriasis is a chronic, immune-related, inflammatory skin disease with various clinical features. It is found most frequently in 30- to 40-year-olds, and its incidence in children and adults has grown over the last 3 decades.^{1,2} The prevalence of psoriasis among adults has been reported to range from 0.51% to 11.43% of the world's population.³ In addition to the physical burden of the disease, psoriasis can create a socioeconomic burden due to its direct and indirect costs. Traditional face-to-face patient care has several indirect financial and non-financial costs, such as lost income, time missed from school or work, and travel costs. Tele dermatology (TD) alone can never be

better than face-to-face, in-office dermatology. However, it can decrease the number of face-to-face visits that are needed, increase access to dermatological care (the ability to obtain care), and improve the accessibility of dermatological care (the ease of obtaining care).⁴

During the COVID-19 pandemic, many countries adopted TD to provide treatment services for acne and chronic autoimmune inflammatory skin diseases.⁵ The TD systems can be classified into 3 distinct formats: "store-and-forward," "real-time," and "hybrid." Store-and-forward involves the submission of digital photographs and related information. These are evaluated later to determine a diagnosis and an appropriate management

Corresponding author: Leena Chularojanamontri

E-mail: leenajim@gmail.com

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ORCID ID: <http://orcid.org/0000-0001-6625-6445>

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strategy. The store-and-forward format contrasts with real-time TD (for example, the use of video conferencing and online meeting rooms), in which the consultation and diagnosis take place synchronously. The third format, hybrid TD, combines the store-and-forward and real-time formats. All 3 formats can be used for direct care, clinical counseling, triage, and follow-up treatment.^{6,7} However, TD involves costs for items such as its administration and imaging support services. These extra costs are typically charged to patients by private hospitals and, for service outside standard consultation hours, by public hospitals. Private or public health insurance does not cover these additional expenses in several countries.

Due to technological advancements, TD can be as efficient as face-to-face visits.^{8,9} Additionally, TD is less time-consuming for patients.¹⁰⁻¹² Different factors are associated with the willingness to use TD versus the willingness to pay (WTP) for TD. Werner et al studied the willingness to use telemedicine for routine care and specialized care. Their findings indicated that the participants were more willing to use telemedicine for routine care than specialized care. The patients' willingness to use telemedicine was also negatively influenced by their concerns about using new technology, attitudes toward telemedicine, and fear that the patient-physician relationship might be undermined.¹³ However, the factors influencing patients' willingness to use telemedicine and their attitudes toward telemedicine may not be the same as the factors and attitudes relating to WTP for telemedicine. Moreover, only a few studies have used a WTP approach to compare the preferences for TD versus traditional in-hospital visits of patients with psoriasis.

This study investigated the attitudes of patients with psoriasis toward TD and the factors influencing their WTP for TD.

MATERIALS AND METHODS

This cross-sectional study was conducted at the Department of Dermatology outpatient clinic, Faculty of Medicine Siriraj Hospital, Bangkok, Thailand, from July 2020 through October 2021. Before this research began, its protocol was approved by the Siriraj Institutional Review Board (Si 490/2020). The eligibility criteria were adult patients with psoriasis who were 18 years or older. Patients were excluded if they could not read or understand the study questionnaire or had mental or psychological diseases. All participating patients provided written informed consent.

Patients individually completed a 2-page, self-administered questionnaire. It was designed to identify attitudes toward TD technology and factors influencing

WTP for TD. Patients needing assistance with any aspect of the questionnaire could ask for the help of an investigator. Details of the following were collected: demographic data (age, sex, education, occupation, income, and comorbid diseases), information related to face-to-face visits to the hospital (waiting time to see a doctor, out-of-pocket expenses, type of medical insurance, and frequency of visits), attitudes toward TD, and WTP for TD. We determined the patient's WTP out-of-pocket by using the payment card model of contingent valuation methods. The patients indicated the maximum value they were WTP for a range of amounts depending on the actual out-patient dermatological care services.

The frequencies of face-to-face visits to Siriraj Hospital to receive psoriasis treatment were classified as "very often" (≥ 1 time/month), "often" (1 time/3 months– < 1 time/month), and "not often" (< 1 time/3 months). The severity of psoriasis was classified according to the nature of the treatment provided and the Self-Administered Simplified Psoriasis Index score. Patients with "moderate to severe psoriasis" were defined as those receiving at least 1 type of systemic treatment for their psoriasis. Patients with "mild psoriasis" were considered those given topical treatments only. Patients with a Self-Administered Simplified Psoriasis Index severity score of < 10 and ≥ 20 were defined as having mild and severe psoriasis, respectively.¹⁴ In the case of patients who indicated a WTP for TD, they were asked to select 1 of 4 possible out-of-pocket costs that they would be willing to pay for the TD service: 200 Baht (\$6, €5.40); 300 Baht (\$9, €8.10); 400 Baht (\$12, €10.80); and 500 Baht (\$15, €13.50). Bidding format was not used in this study. Thus, higher or lower price than that of patient's answer did not offer.

To improve our understanding of the factors influencing WTP for TD services, we also divided patients into 2 groups. "Group A" comprised patients interviewed during the first wave of the COVID-19 epidemic in Thailand (July 2020–December 15, 2020). "Group B" consisted of patients interviewed during the second wave of the COVID-19 pandemic (December 16, 2020–October 2021). These groupings were made because TD began to be increasingly used after the first wave as part of measures to reduce the spread of COVID-19 infections in Thailand. We postulated that more patients in the second wave would have had experience with or known about TD than in the first wave.

Statistical analysis

Statistical analyses were conducted using PASW Statistics for Windows, version 18.0 (SPSS Inc., Chicago, IL,

USA). Continuous data are presented as the mean \pm standard deviation (SD) and median (interquartile range), whereas categorical data are presented as frequencies and percentages. As appropriate, group comparisons were made using the Mann–Whitney U test, the two-tailed test, the Chi² test, or Fisher’s exact test. Statistical significance was defined as *P* values less than 0.05. The factors associated with WTP for TD were analyzed using multiple logistic regression. This analysis included only those variables with a *P* value of less than 0.2 in a univariate analysis.

RESULTS

The 200 enrolled patients had a mean age of 45.38 ± 13.22 years. There were 115 women (57.50%) and 85 men (42.50%), and most of the patients lived in urban areas (69%). The majority (73.5%) also had postsecondary education (at universities, colleges, trade schools, or vocational schools; [Table 1](#)).

Although most of the patients were full- or part-time workers, 127 (63.5%) stated that they did not need to take time off from work to visit the hospital. The most common comorbid diseases were hypertension, dyslipidemia, diabetes mellitus, and psoriatic arthritis, in decreasing order of frequency. Most patients (80.5%) had had psoriasis for more than 5 years. Based on their treatments, 152 (76%) had moderate to severe psoriasis. Most patients often visited the hospital, and the waiting time to see a dermatologist was at least 30 minutes. Public and private insurance were used to cover the medical expenses of 63% and 7.5% of the patients, respectively. The additional out-of-pocket expenses associated with the in-person hospital visits (such as travel costs and the hospital’s administrative charge) were more than 200 Baht (\$6, €5.40) for most patients.

One hundred thirty-three patients (66.5%) were unfamiliar with TD. However, 144 patients (72%) indicated that they were willing to pay for the service if it were introduced. Most patients believed TD would provide several benefits for psoriasis treatment in terms of a more efficient and quicker service, reduced costs (by eliminating the out-of-pocket expenses for in-person hospital visits), and no adverse effects on the doctor-patient relationship ([Table 2](#)). The proportion of patients with these positive attitudes was significantly higher among patients who indicated a WTP than patients who did not. It should be noted that the proportion of patients who knew about TD was higher among the WTP group than the non-WPT group.

Furthermore, the WTP group of patients had substantially fewer concerns about TD in general than the non-WPT group (*P* = 0.010). However, there were no

significant differences in the specific points of concern of the 2 groups: the use of new forms of technology, the quality of internet connections, and online privacy and safety. The patients in the WTP group had significantly higher levels of education and greater out-of-pocket expenses for their in-person hospital visits than those in the non-WTP group. Regarding the out-of-pocket costs that patients were still prepared to pay for the TD service, 43.1%, 34%, 5.6%, and 17.4% selected 200 Baht, 300 Baht, 400 Baht, and 500 Baht, respectively (data not shown).

Univariate analysis revealed that the significant factors associated with WTP were higher educational levels, reduction of in-hospital visit expenses, TD options suited to psoriasis treatment, ability to undertake routine appointments, reduction in treatment duration, cheaper than a face-to-face visit, absence of adverse effects on the doctor-patient relationship, and concerns about the use of TD for psoriasis treatment ([Table 3](#)). Using multivariate analysis, the independent factors associated with WTP were higher educational levels, elimination of out-of-pocket, in-hospital visit expenses, owning a business, TD options suited to psoriasis treatment, and no adverse effects on the doctor-patient relationship.

In a comparison between WTP for TD among patients during the first and second waves of the COVID-19 pandemic in Thailand, a significantly higher proportion of patients during the second wave knew about TD than during the first wave (49.1% vs 27.9%; *P* = 0.005). All patients in the second wave (100%) believed that TD could be used for psoriasis treatment and routine appointments. The corresponding values for the patients in the first wave were significantly lower (89.1% for psoriasis treatment [*P* = 0.007] and 91.8% for routine appointments [*P* = 0.039]; data not shown).

DISCUSSION

Even before the COVID-19 pandemic era, the use of TD had been growing dramatically for 2 decades. This development resulted from steady advances in technology that enabled patients to easily access medical care even if they lived in usually difficult-to-reach public health locations. The effectiveness of TD was found to be comparable to that of face-to-face visits by a randomized controlled trial in 2019 (N = 592) and a systemic review in 2020 (4 randomized controlled trials, 2 prospective cohorts, and 1 case series; N = 596).¹⁵ Even when using TD for psoriasis treatment, there were significant improvements in psychological impairment (evaluated by psychological functioning and the Dermatology Life Quality Index) and disease severity (assessed by the Psoriasis Area and

TABLE 1. Demographic data and related information of 200 patients with psoriasis visiting hospital from July 2020 through October 2021.

Variables	Values
Sex, n (%)	
Females	115 (57.5)
Age (years), mean \pm SD	45.38 \pm 13.22
Current address, n (%)	
Urban area	138 (69)
Rural area	62 (31)
Education level, n (%)	
Less than or equal to secondary school	53 (26.5)
Postsecondary	147 (73.5)
Occupations, n (%)	
Full-time worker	115 (57.5)
Part-time worker	76 (38)
Business owner	9 (4.50)
Income (Baht/month), n (%)	
\leq 5,000	36 (18)
5,001–10,000	19 (9.5)
10,001–20,000	48 (24)
20,001–50,000	71 (35.5)
> 50,000	26 (13)
Underlying diseases, n (%)	
Hypertension	121 (60.5)
Dyslipidemia	56 (28)
Diabetes mellitus	38 (19)
Psoriatic arthritis	32 (16)
Psoriatic arthritis	31 (15.50)
Duration of psoriasis (years), n (%)	
< 5	39 (19.5)
5–10	53 (26.50)
> 10	108 (54)
Severity scores as assessed by the Self-Administered Simplified Psoriasis Index, n (%)	
Mild (< 10)	135 (67.5)
Moderate (10 –< 20)	52 (26)
Severe (\geq 20)	13 (6.5)
Current treatment, n (%)	
Only topical treatment	48 (24)
Systemic treatment	152 (76)
Frequency of hospital visits due to psoriasis, n (%)	
Very often (\geq 1 times/month)	15 (7.50)
Often (1 time/3 months–< 1 time/month)	148 (74)
Not often (< 1 time/3 months)	37 (18.50)
Waiting time to see a doctor, n (%)	
< 15 minutes	6 (3)
15–30 minutes	58 (29)
31–< 60 minutes	57 (28.5)
1–2 hours	50 (25)
> 2 hours	29 (14.5)
Medical insurance, n (%)	
Public insurance	126 (63)
Private insurance	15 (7.5)
Self-insured	59 (29.5)
Extra expense for hospital visit (Baht), n (%)	
\leq 200 Baht (\leq \$6, €5.40)	56 (28)
> 200 Baht (> \$6, €5.40)	144 (72)

Abbreviation: SD; standard deviation

TABLE 2. Comparison of attitudes of patients with psoriasis who were willing and not willing to pay for teledermatology.

Attitudes toward WTP for teledermatology of psoriatic patients	Total (N = 200)	WTP (n = 144)	Non-WTP (n = 56)	P
	n (%)	n (%)	n (%)	
Awareness of teledermatology	67 (37.5)	54 (37.5)	13 (23.2)	0.055
Efficiency				
Teledermatology can be used to treat psoriatic patients	188 (94.0)	140 (97.2)	44 (78.6)	< 0.001*
What effect does teledermatology have on psoriatic treatment?				
Increased quality	65 (37.5)	54 (37.5)	11 (19.6)	0.011*
Decreased quality	33 (16.5)	18 (12.5)	15 (26.8)	
Same quality	102 (51.0)	72 (50.0)	30 (53.6)	
Teledermatology enables patients to complete routine appointments	188 (94.0)	140 (97.2)	48 (85.7)	0.005*
Quicker than face-to-face visits				
Teledermatology can reduce the length of treatment	193 (96.5)	142 (98.6)	51 (91.1)	0.019*
Cheaper than face-to-face visits				
Teledermatology has the potential to reduce the cost of treatment	189 (94.5)	142 (98.6)	47 (83.9)	< 0.001*
Teledermatology will impair the doctor-patient relationship	57 (28.5)	29 (20.1)	28 (50.0)	< 0.001*
Concerned about teledermatology use for psoriasis	103 (51.5)	66 (45.8)	37 (66.1)	0.010*

*Indicates statistical significance

Severity Index, Physician Global Assessment, and body surface area). Furthermore, TD improved the patient-physician relationship as it was easier for patients to see a doctor.¹⁵

Attitudes toward TD differ between subgroups of populations and patients, depending on factors such as a country's economic development, socioeconomic status, and culture. A survey in the United States of the attitudes of 100 dermatology patients toward synchronous TD during the COVID-19 era reported that 88.9% were satisfied, and 81.8% had not experienced any technical difficulties. However, despite the immense satisfaction with synchronous TD, 68.7% of the patients preferred a face-to-face consultation for their next visit.¹⁶ Another study of 168 dermatology patients from the United States reported that most of the patients liked TD due to the more efficient use of their time (81.1%), transportation not being required (74.2%), and the ability to maintain social distancing (73.6%). The 2 most common criticisms

given by the minority of patients who did not like TD were lack of physical touch (26.8%) and a perception that they received inadequate assessments (15.7%). Regarding whether TD could adequately substitute for in-person visits, 55% agreed that it could, 25% disagreed, while the remaining 20% neither agreed nor disagreed.¹⁷

Most patients in the studies conducted in Thailand and the United States perceived TD to be more efficient and less time-consuming than traditional in-person visits. On the other hand, the patients surveyed in both countries expressed concerns about a possible deterioration of the doctor-patient relationship and the lack of physical touch. Given that Thailand and the United States are very different in terms of ethnicity, culture, and social and economic development, the commonalities between the findings suggest that those positive and negative attitudes may be widespread.

We searched the PubMed and Embase databases using the keywords "willingness to pay," "telemedicine,"

TABLE 3. Multiple logistic regression analysis of factors associated with willingness to pay for teledermatology for the treatment of psoriasis.

	Univariate analysis		Multivariate analysis	
	Crude OR (95% CI)	P	Adjusted OR (95% CI)	P
Higher education levels	2.974 (1.525–5.799)	0.001*	4.647 (1.820–11.865)	0.001*
Greater extra expenses for in-hospital visits	2.093 (1.082–4.050)	0.028*	3.626 (1.488–8.837)	0.005*
Occupation				
Full-time (ref.)	1		1	
Part-time	596187144 (0.000–N/A)	0.999	297481405 (0.000–N/A)	0.999
Business owner	0.753 (0.400–1.416)	0.378	3.040 (1.129–8.191)	0.028*
Awareness of teledermatology	1.985 (0.979–4.021)	0.057	2.419 (0.977–5.988)	0.056
Efficiency				
Teledermatology can be used to treat psoriatic patients	9.545 (2.930–31.102)	< 0.001*	7.768 (1.486–40.620)	0.015*
What effect does teledermatology have on psoriatic treatment?				
Increased quality	2.045 (0.942–4.443)	0.071	2.234 (0.896–5.575)	0.085
Decreased quality	0.500 (0.223–1.120)	0.092	1.093 (0.356–3.350)	0.877
Same quality	1		1	
Teledermatology enables patients to complete routine appointments	5.833 (1.681–20.242)	0.005*	1.565 (0.223–10.996)	0.653
Quicker than face-to-face visits				
Teledermatology can reduce the length of treatment	6.961 (1.309–37.004)	0.023*	0.543 (0.028–10.356)	0.685
Cheaper than face-to-face visits				
Teledermatology has the potential to reduce the cost of treatment	13.596 (2.836–65.172)	0.001*	7.624 (0.819–70.991)	0.074
Teledermatology will impair the doctor-patient relationship	0.252 (0.130–0.490)	< 0.001*	0.314 (0.129–0.762)	0.011*
Concerned about teledermatology use for psoriasis	0.435 (0.228–0.827)	0.011*	0.499 (0.220–1.136)	0.098

*Indicates statistical significance

“teledermatology,” and “skin diseases.” Table 4 summarizes the findings of published studies evaluating factors that influence WTP for TD to treat skin diseases (psoriasis, melanoma, acne, and skin cancer).¹⁸⁻²² Qureshi et al reported that 95% of patients with psoriasis and melanoma were willing to pay out of pocket for TD if it provided quicker access to care, compared to only 58% if the access times for TD and traditional in-person visits were the same. The patients also reported that they were willing to pay

a median of \$25 out of pocket for TD consultations.¹⁸ Seeing specialists (dermatologists) to detect melanoma and skin cancer was a critical factor in favor of TD.¹⁹ For patients with acne, the critical factors supporting the use of TD were a less expensive service, fewer hours away from work or school, a reduction in lost income, and lower travel costs. Mori et al studied WTP for electronic follow-up visits among acne patients on isotretinoin therapy in the United States. Sixty-four patients (61%)

TABLE 4. Factors associated with willingness to pay for teledermatology of patients with skin diseases.

Year	Authors	Study design	Skin diseases	Sample size	Type of teledermatology	Factors associated with WTP for teledermatology
2006	Qureshi et al ¹⁸	Face-to-face interview with hypothetical scenario	- Psoriasis - Melanoma	50 42	N/A	- Quicker than face-to-face visits
2015	Spinks et al ¹⁹	Discrete choice experiment questionnaire for teledermoscopy screening detecting melanoma	- Melanoma	35	Store-and-forward (phone camera)	- Images reviewed by dermatologist
2016	Pathipati et al ²⁰	One-on-one discussion regarding their experience	- Rash & acne	10	Store-and-forward	- Cheaper than face-to-face visits
2016	Mori et al ²¹	Individual survey responses	- Acne vulgaris	98	N/A	- Hours of work and school missed - Lost wages - Travel costs
2018	Snoswell et al ²²	Discrete choice experiment questionnaire for teledermoscopy screening for detecting skin cancer	- Skin cancer	113	Store-and-forward (phone camera)	- Images reviewed by dermatologist
2022	Our study	Face-to-face interview	- Psoriasis	200	Not specific type	Independent factors - Higher education levels - Greater expenses of in-hospital visits - Business owner - Utilizable options of teledermatology - Does not affect doctor-patient relationship

N/A, not available

were willing to pay out of pocket for an e-visit, for a median cost of \$25.²¹ Most of the participants (64.8%) reported having no concerns about the safety of e-visits.

Our study added further information for patients with psoriasis. Specifically, it identified that the independent factors associated with WTP for TD services were higher educational levels, elimination of out-of-pocket, in-hospital

visit expenses, owning a business, TD options suited to psoriasis treatment, and no adverse effects on the doctor-patient relationship. The payment card method used in this study had some limitations, including a range bias, in which participants tended to choose the lower half of the stated price, and the range of provided amounts had the potential to affect the maximum cost of TD.

CONCLUSION

In conclusion, although TD cannot replace face-to-face visits for psoriasis treatment, its use is likely to continue to increase markedly. Understanding the attitudes of patients and the factors associated with WTP is essential for developing successful TD services and broadening their appeal to patients with psoriasis.

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Conflicts of interest

The authors have no relevant financial or non-financial interests to disclose.

Abbreviations

CI: confidence interval

N/A: not available

OR: odds ratio

SD: standard deviation

TD: tele dermatology

WTP: willingness to pay

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