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## Factors influencing willingness to pay and show images with teledermatology during the COVID-19 pandemic



*To the Editor:* We read with interest the article by Linggonegoro et al,<sup>1</sup> which discussed limited English proficiency as a barrier toward uptake of teledermatology. We conducted a convergent parallel mixed-method study to explore the willingness to use teledermatology during the COVID-19 pandemic.<sup>2</sup> Nine hundred forty-two questionnaires and 26 in-depth interviews were administered to dermatology outpatients or their primary caregivers. Questionnaire responses were consolidated and used in multivariable regression analyses, while interview transcripts were coded and analyzed using grounded theory. Quantitative and qualitative findings were cross-validated for convergence.<sup>2</sup> We found that the willingness to use teledermatology was strongly correlated with barriers, such as the willingness to show images of the body on photo/video and financial costs. In this letter, we

provide secondary analysis to build upon the discussion of barriers in the paper by Linggonegoro et al.<sup>1</sup>

In our data, females and ethnic Malays (who lean religiously conservative) and each individual's concerns over data security and privacy were associated with lower willingness to show body images over photo/video (Table I). These concerns were specific to "zoom bombing" and inappropriate recording. Conversely, a higher perceived quality of telemedicine was associated with increased willingness to show body images. The findings suggest that appropriate use of technology and reassurance on security features be added to a telemedicine preconsult instructional package for patients.

Of the participants, 47.3% were unwilling to pay more than half of the standard in-person consultation fee for a teledermatology consult. Females, prior experience with teledermatology, willingness to show body images, higher perceived quality, diagnostic accuracy of teledermatology, usage for social distancing, faster appointment times, and reduced commuting were associated with increased

**Table I.** Univariable and multivariable linear regression of factors associated with willingness to show body parts on photo/video\*

Independent variables	Univariable		Multivariable		
	Unstandardized coefficient (std error)	Sig.	Unstandardized coefficient (std error)	Standardized coefficients	Sig.
Age	-0.001 (0.002)	0.772	0 (0.002)	0.013	0.745
Gender (female, reference group: males)	-0.446 (0.074)	<0.001 <sup>†</sup>	-0.331 (0.078)	-0.148	0.000 <sup>†</sup>
Race (reference group: Chinese)					
Malay	-0.406 (0.114)	<0.001 <sup>†</sup>	-0.299 (0.120)	-0.088	0.013 <sup>†</sup>
Indian	-0.174 (0.121)	0.152	-0.142 (0.127)	-0.038	0.263
Caucasian	0.445 (0.240)	0.064	0.221 (0.240)	0.032	0.356
Others	-0.416 (0.198)	0.036 <sup>†</sup>	-0.378 (0.223)	0.058	0.090
Education level	0.135 (0.037)	<0.001 <sup>†</sup>	0.065 (0.043)	0.059	0.128
Paying rate (self-paying, reference group: government subsidized)	0.018 (0.107)	0.870	-0.022 (0.113)	-0.007	0.841
Number of comorbidities	-0.058 (0.057)	0.307	-0.059 (0.06)	-0.036	0.321
Average daily phone use	-0.041 (0.037)	0.267	-0.051 (0.041)	-0.047	0.208
Average daily computer use	0.091 (0.026)	<0.001 <sup>†</sup>	0.057 (0.031)	0.073	0.065
Prior experience of telemedicine	0.361 (0.141)	0.010 <sup>†</sup>	0.222 (0.139)	0.055	0.111
Perceived quality of telemedicine	0.314 (0.067)	<0.001 <sup>†</sup>	0.301 (0.07)	0.147	<0.001 <sup>†</sup>
Nonuse as concern about data privacy	-0.381 (0.076)	<0.001 <sup>†</sup>	-0.34 (0.081)	-0.147	<0.001 <sup>†</sup>
COVID-19 phase (period of relaxed restrictions, reference group: period of heightened restrictions)	-0.164 (0.080)	0.042 <sup>†</sup>	-0.078 (0.081)	-0.033	0.339

Sig., Significance.

\*Willingness to show body parts on photo/video was assessed as a composite outcome comprising the willingness to show images of various body parts (face, limbs, trunk, chest, axillae, inner portion of the thighs, and genitalia). These were graded individually on a Likert scale. A sensitivity analyses excluding the chest from this composite outcome showed similar findings. Adjusted R square of the model was 0.102.

<sup>†</sup>P values < .05.

**Table II.** Univariable and multivariable linear regression of factors associated with willingness to pay for tele dermatology\* relative to a standard in-person consult

Independent variables	Univariable		Multivariable		
	Unstandardized coefficient (std error)	Sig.	Unstandardized coefficient (std error)	Standardized coefficients	Sig.
Age	-0.002 (0.001)	<0.001 <sup>†</sup>	-0.002 (0.001)	-0.058	0.153
Gender (female, reference group: males)	0.086 (0.047)	0.068	0.155 (0.049)	0.112	0.002 <sup>†</sup>
Race (Chinese, reference group: other races)	0.116 (0.052)	0.026 <sup>†</sup>	0.091 (0.053)	0.059	0.084
Education level	0.045 (0.024)	0.058	0 (0.027)	-0.001	0.972
Paying rate (self-paying, reference group: government subsidized)	0.067 (0.069)	0.334	0.048 (0.07)	0.024	0.488
Number of comorbidities	-0.012 (0.036)	0.734	0.016 (0.037)	0.015	0.671
Time to travel to dermatologist	-0.025 (0.026)	0.339	-0.018 (0.026)	-0.024	0.492
Average daily phone use	-0.017 (0.023)	0.478	-0.034 (0.025)	-0.051	0.175
Average daily computer use	0.034 (0.017)	0.040 <sup>†</sup>	0.011 (0.019)	0.023	0.564
Prior experience of telemedicine	0.315 (0.089)	<0.001 <sup>†</sup>	0.228 (0.088)	0.089	0.010 <sup>†</sup>
COVID-19 phase (period of relaxed restrictions, reference group: period of heightened restrictions)	0.069 (0.051)	0.172	0.062 (0.038)	0.056	0.111
Willingness to show body parts over photo/video	0.163 (0.020)	<0.001 <sup>†</sup>	0.103 (0.025)	0.166	<0.001 <sup>†</sup>
Perceived quality and accuracy of tele dermatology	0.306 (0.053)	<0.001 <sup>†</sup>	0.2 (0.065)	0.124	0.002 <sup>†</sup>
Usage for social distancing	0.196 (0.047)	<0.001 <sup>†</sup>	0.105 (0.053)	0.076	0.048 <sup>†</sup>
Usage if taught to set up	0.039 (0.065)	0.552	-0.038 (0.07)	-0.020	0.585
Usage for faster appointment time	0.234 (0.046)	<0.001 <sup>†</sup>	0.152 (0.052)	0.110	0.004 <sup>†</sup>
Usage to reduce commuting time and cost	0.330 (0.052)	<0.001 <sup>†</sup>	0.191 (0.062)	0.122	0.002 <sup>†</sup>
Usage if financially incentivized	0.026 (0.055)	0.632	-0.169 (0.065)	-0.104	0.010 <sup>†</sup>
Usage if reimbursable	-0.026 (0.073)	0.722	-0.094 (0.081)	-0.044	0.250
Nonuse because of poorer communication	-0.032 (0.047)	0.496	0.049 (0.053)	0.036	0.354
Nonuse because no confidence in setting up	-0.152 (0.071)	0.032 <sup>†</sup>	-0.084 (0.08)	-0.042	0.294
Nonuse as the existing delivery models are working	-0.125 (0.065)	0.055	0.078 (0.077)	0.042	0.309
Nonuse as concern about diagnostic accuracy of telemedicine	-0.144 (0.061)	0.018 <sup>†</sup>	-0.029 (0.078)	-0.017	0.701
Nonuse as concern about data privacy	0.010 (0.049)	0.838	-0.006 (0.055)	-0.005	0.900

Sig., Significance.

\*Willingness to pay was assessed as a composite outcome comprising the self-reported willingness to pay for tele dermatology before COVID-19 pandemic, during the pandemic, and after the pandemic, expressed as a percentage relative to a standard in-person consult. Adjusted R square of the model was 0.125.

<sup>†</sup>P values < .05.

willingness to pay (Table II). The qualitative data suggested that patients believed telemedicine should be priced lower because it was inferior in quality and perceived to be less costly for the provider to use. Some patients considered their participation an assistance to the provider and should be compensated by a reduced fee. At the same time, the same interviewees also acknowledged that doctor's time

employed was similar, and so were more willing to pay the same as an in-person experience.

Tele dermatology is a growing mode of service delivery. We urge providers to preidentify and address the barriers to adoption rather than confront them after implementation, to ensure a positive experience and service sustainability.<sup>3,4</sup> Extending Linggongoro et al,<sup>1</sup> we identified the importance of

social and cultural norms in the design of telemedicine solutions.<sup>1,5</sup> Sensitivity to these factors is particularly important when deploying teledermatology in heterogeneous populations. We also identified modifiable factors influencing uptake, such as the perceived quality and security of the technology and practical benefits, such as convenience and social distancing. Because different patient populations may perceive benefits differently, education should be embedded in improvement and in strategies that promote service.

Because many barriers to telemedicine adoption are perceptual and change with values and norms, providers should revisit these concerns periodically to continually adapt their deployment strategies. Future research can consider exploring provider-related barriers to uptake, which we did not assess in this study.

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#### **Conflicts of interest**

None disclosed.

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