

# Shaping the Future of Tele dermatology: A Literature Review of Patient and Provider Satisfaction with Synchronous Teledermatology during the COVID-19 Pandemic

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## Abstract

Following the onset of the COVID-19 pandemic, widespread adoption of synchronous teledermatology (e.g., live videoconferencing) has increased patient and provider familiarity. To our knowledge, no teledermatology reviews have exclusively characterized patient and provider satisfaction with synchronous models of teledermatology. This study determines the quantitative evaluation of patient and provider satisfaction through a literature review of synchronous teledermatology studies conducted during the COVID-19 pandemic. A review of the literature was performed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines within the PubMed database. Search terms included, but were not limited to, *teledermatology*, *patient satisfaction*, and *provider satisfaction*. Studies were evaluated for quality of evidence based on guidelines described by the Oxford Center for Evidence-based Medicine. Fifteen studies satisfied the inclusion criteria which described the satisfaction of 7871 patients and 146 providers with synchronous teledermatology during the COVID-19 pandemic. Patients and providers were overall satisfied with access measures, the patient-provider relationship and the ability of synchronous teledermatology to meet patient needs. Limitations of the virtual physical exam and image or video quality were two consistent limiting factors in patient and provider experience, respectively. Patients and providers perceive that synchronous teledermatology meets the needs of the patient. Patients perceived satisfactory patient-provider relationship through synchronous teledermatology. Practices can identify best applications and educate patients on expectations of the virtual examination in order to enhance utilization and sustainability of synchronous teledermatology beyond the pandemic.

## Introduction

Telemedicine utilization increased sharply following the declaration of the COVID-19 pandemic with dermatologists appearing more likely to implement synchronous models compared to asynchronous ones.<sup>1</sup>

Synchronous models allow the transmission of information with real time interactions through video conferencing systems, while asynchronous models involve the transmission of stored or recorded medical images or data onto an internet platform that is assessed in a separate time frame by a medical provider.

Prior to the pandemic, teledermatology services have expanded over the past decade and have been developed into effective models to care for common dermatologic conditions.<sup>1-3</sup>

The vast majority of pre-pandemic dermatologic research investigated asynchronous applications of teledermatology, which have consistently reported satisfaction.<sup>4, 5</sup> Given the widespread exposure and essential nature of synchronous teledermatology during the pandemic, we aim to identify the specific aspects of synchronous teledermatology that enhance and detract from satisfaction. The aim of this study is to determine the quantitative evaluation of patient and provider satisfaction through a literature review of studies on synchronous teledermatology conducted during the COVID-19 pandemic. This study also evaluates the likelihood of patients and providers to continue practicing teledermatology in the future

## Methods

We searched PubMed for articles published from March 1<sup>st</sup>, 2020 to May 1<sup>st</sup>, 2022. Search terms included, but were not limited to *teledermatology*, *patient satisfaction*, and *provider satisfaction*. Studies published in English that evaluated quantitative patient or provider satisfaction of video-based synchronous teledermatology were included. Studies that solely relied on telephone-based synchronous teledermatology were excluded. No restrictions were placed on age or gender of the study participants. While studies that employed aspects of synchronous and asynchronous teledermatology (hybrid) were included, studies limited to asynchronous models (e.g., store-and-forward) were excluded.

An independent researcher identified studies that satisfied the inclusion criteria. Satisfaction questions were categorized into five domains: overall satisfaction, technical quality, quality of care, patient-provider relationship, and accessibility. Included studies were assessed for level of evidence based on the Oxford Centre for Evidence-based Medicine Scale.

Studies used various scales to assess satisfaction. Therefore, a standardized criteria<sup>4</sup> was developed to define how each scale demonstrated satisfaction presented in Table 1. A satisfaction outcome was considered to demonstrate satisfaction if at least 80% of subjects reported a response demonstrating satisfaction outlined in the table. This methodology was consistent with a previous teledermatology satisfaction study.<sup>4</sup>

## Results

Our review identified 58 potential studies of which 15 studies satisfied the inclusion criteria. A PRISMA flow diagram of the study screening process is presented in Supplemental Figure I. A total of 15 studies evaluated quantitative patient satisfaction with synchronous teledermatology. Level of evidence for all articles were 3b except Chang et al was 2c.

Table 2 summarizes findings on patient satisfaction with synchronous teledermatology. The study sample sizes ranged from 14 to 5,229 respondents. Of the satisfaction domains, questions that addressed quality of care and technical quality were more common than questions on accessibility, overall satisfaction, and patient-provider relationship. Patients were largely satisfied with aspects of technical quality. All studies noted satisfaction with sound quality. Within the domain of quality of care, patients were not satisfied with the physical examination or quality compared to in-person care. Patients were satisfied with visit preparation and discharge and the visit's ability to address their needs or treatment. Patients were uniformly satisfied with all aspects of the patient-provider relationship and accessibility measures. Six of the seven studies reported a high patient willingness to use teledermatology in the future. Two of three studies reported low preference compared to in-person care, yet the largest study showed a preference for teledermatology.

Table 3 summarizes the findings on provider satisfaction with synchronous teledermatology. A total of four studies evaluated provider satisfaction. Of the satisfaction domains assessed, questions that addressed technical quality and quality of care were most frequently reported, followed by patient-provider relationship, accessibility, and overall satisfaction. Level of evidence for the four studies were 3b. The study samples ranged from 6-82 providers. One study reported overall provider dissatisfaction, while the other reported overall satisfaction. Within the domain of technical quality, providers were not satisfied with video/image quality in all four studies and with sound quality in two of the three studies.

Within the domain of quality of care, providers were not satisfied with the quality of the teledermatology visit compared to in-person care. However, providers were satisfied with the service's ability to address patients' needs and treatment concerns. One of two studies noted that providers were not satisfied with the patient-to-provider relationship. One study reported provider satisfaction with length of visit. Provider willingness to use teledermatology in the future varied among the three studies.

## **Discussion**

The majority of studies report patient future willingness to use synchronous teledermatology. Patients were highly satisfied with the patient-provider relationship and increased access to care. Both patients and providers were satisfied that patient needs were met by the visits.

The virtual physical examination and quality compared to in-person care imparted patient dissatisfaction. Moore et. al noted that patients with lower satisfaction scores were more likely to experience an unsatisfactory virtual physical exam ( $p<0.01$ ). This study also noted that patients with lower satisfaction scores were more likely to experience technical difficulties ( $p<0.01$ ). As limitations of the virtual physical examination preclude the use of synchronous teledermatology for all dermatologic conditions, individual practices can identify "best-fit" applications and incorporate pre-appointment patient instruction and review of expectations.<sup>22</sup> One survey conducted during the pandemic reported that 96% of providers believed a total body skin examination required an in-person visit, while 97% believed acne could be managed through synchronous teledermatology.<sup>1</sup>

Providers universally reported low satisfaction with video or image quality and variable comfort with synchronous teledermatology. Practices can consider use of hybrid platforms in which patient provided photos can augment the video visits. Practices can also enact quality measures to ensure provider comfort through training and education.

A limitation of this study is that it does not assess how satisfaction may differ among populations with poor internet connectivity or digital literacy. It is estimated that approximately 21 million people in the United States lack high-quality broadband access,<sup>23,24</sup> with racial minorities and low-income families less likely to have home broadband.<sup>25</sup> These populations remain vulnerable to lack of access, technical issues related to internet connectivity and quality of image or video. Other limitations of this study include the relatively small number of articles which met the inclusion criteria as well as a lack of standardized scoring scales for synchronous teledermatology satisfaction.

The pandemic revealed the integral role of synchronous teledermatology when healthcare, environmental or personal conflicts prevent in-person care. This article identifies the two key limiting aspects of patient and provider satisfaction with synchronous teledermatology: physical examination and video quality, respectively. Proactive improvements in workflows, technology and patient education may enhance the patient and provider experience with teledermatology beyond the pandemic.

### **Learning Objectives**

- Patients indicate future willingness to use synchronous teledermatology
- Patients are highly satisfied with the patient-provider relationship and access to care when using synchronous teledermatology
- Patients and providers perceive that synchronous teledermatology addresses patient needs and concerns

- As patients were not consistently satisfied with the physical examination and quality of synchronous teledermatology compared to in-person visits, dermatologists can identify best fit applications.
- Providers were not consistently comfortable with the technology or satisfied with image or video quality during synchronous teledermatology visits. These findings indicate a need for standardized training and quality assurance of connectivity measures.

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**Table 1. Criteria used to determine how scales demonstrated satisfaction**

<b>Number of Points in Scale</b>	<b>Example of Scales Used</b>	<b>Responses Demonstrating Satisfaction</b>
2	yes, no	question specific
3	less preferred, equal preference, more preferred easy, neutral, difficult better, as good, worse agree, neither, disagree	equal preference, more preferred easy better/as good question specific
4	strongly disagree/disagree/agree/strongly agree excellent, good, acceptable, poor very satisfied/satisfied, partially satisfied, unsatisfied	agree, strongly agree good, excellent very satisfied, satisfied
5	poor, fair, good, very good, excellent much better, a little better, the same, a little bit worse, much worse very satisfied, satisfied, average, unsatisfied, very unsatisfied very satisfied, somewhat satisfied, neutral, somewhat dissatisfied, very dissatisfied	good, very good, excellent much better, a little bit better, the same very satisfied, satisfied  very satisfied, somewhat satisfied
10	one to ten	8, 9, 10

**Table 2.** Patient satisfaction with synchronous teledermatology

Primary Author		Asabor et al <sup>7</sup>	Fluhr et al <sup>8</sup>	Hamad et al <sup>9</sup>	Kaunitz et al <sup>10</sup>	Moore et al <sup>11</sup>	Mostafa et al <sup>12</sup>	Pearlman et al <sup>13</sup>	Ruggiero et al <sup>14</sup>	Handa et al <sup>15</sup>	Cheng et al <sup>16</sup>	Kohn et al <sup>17</sup>	Yadav et al <sup>18</sup>	Chang et al <sup>19</sup>	Shah et al <sup>20</sup>	Yersoshalmi et al <sup>21</sup>
<i>Study Size</i>	n	548	82	184	602	171	62	100	52	5229	145	125	201	202	14	168
<i>Overall Satisfaction</i>				Yes		Yes	Yes	Yes		No	Yes	Yes				Yes
<i>Technical Quality</i>	Ease of Use/Comfort	Yes		Yes	Yes	Yes	Yes				Yes		No	Yes	Yes	Yes
	Video/Image Quality	Yes	No	Yes			Yes	Yes				Yes	No	Yes		Yes
	Sound Quality	Yes	Yes	Yes			Yes	Yes				Yes	Yes	Yes		Yes
	Connection		Yes		Yes	No		Yes								
<i>Quality of Care</i>	Visit Preparation & Discharge	Yes			Yes	Yes	Yes	Yes								
	Compared to in Person	Yes			Yes	Yes				No			No	No	No	No
	Physical Exam				No	No		No						Yes		No
	Needs or Treatment Addressed		Yes	Yes	Yes		Yes	Yes	Yes				Yes	Yes	Yes	
<i>Provider to Patient Relationship (PPR)</i>	Overall PPR Satisfaction		Yes	Yes		Yes	Yes		Yes		Yes		Yes			Yes
	Provider Communication			Yes	Yes		Yes						Yes			
<i>Access</i>	Save Time	Yes		Yes			Yes						Yes	Yes		
	Length of Visit		Yes								Yes					

	Access to Device					Yes		Yes								
	<i>Future Willingness</i>	84%	44%				92%		92%				85%	91%		80%
	<i>Preference over in-person</i>				70%	24%		31%								

'Yes' represents at least 80% of patients reported a response demonstrating satisfaction outlined in Table 1; 'No' represents less than 80% of patients reported a response not demonstrating satisfaction outlined in Table 1.

**Table 3.** Provider satisfaction with synchronous teledermatology

<b>Article Number</b>		Asabor et al <sup>7</sup>	Fluhr et al <sup>8</sup>	Handa et al <sup>15</sup>	Kohn et al <sup>17</sup>
<i>Study Size</i>	n	24	82	34	6
<i>Overall Satisfaction</i>				No	Yes
<i>Technical Quality</i>	Ease of Use/Comfort	Yes		No	
	Video/Image Quality	No	No	No	No
	Sound Quality	No	Yes		No
	Connection		Yes		No
<i>Quality of Care</i>	Compared to in person	No			
	Needs or Treatment Addressed		Yes		
<i>Provider to Patient Relationship (PPR)</i>	Overall PPR Satisfaction		Yes	No	
<i>Access</i>	Length of Visit		Yes		
<i>Future Willingness</i>		87%	13%	58%	

'Yes' represents at least 80% of providers reported a response demonstrating satisfaction outlined in Table 1; 'No' represents less than 80% of providers reported a response not demonstrating satisfaction outlined in Table 1.