Shaping the future of teledermatology: a literature review of patient and provider satisfaction with synchronous teledermatology during the COVID-19 pandemic

John Miller¹ and Elizabeth Jones²

¹Sidney Kimmel Medical College; and ²Department of Dermatology and Cutaneous Biology, Thomas Jefferson University Sidney Kimmel Medical College, Philadelphia, PA, USA

doi:10.1111/ced.15320

Abstract

Following the onset of the COVID-19 pandemic, widespread adoption of synchronous teledermatology (e.g. live video conferencing) has increased patient and provider familiarity with the method. To our knowledge, no teledermatology reviews have exclusively characterized patient and provider satisfaction with synchronous models of teledermatology. This study quantitatively evaluated patient and provider satisfaction through a literature review of synchronous teledermatology studies conducted during the COVID-19 pandemic. We undertook a review of the literature using the PubMed database, which was performed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. The 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 Centre for Evidence-based Medicine. In total, 15 studies satisfied the inclusion criteria, and 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 examination and image/video quality were consistent limiting factors for the patient and provider experience, respectively. Patients and providers perceive that synchronous teledermatology can meet the needs of the patient. Patients perceived a 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 the use and sustainability of synchronous teledermatology beyond the pandemic.

Introduction

Telemedicine is a form of remote medical provision, with both synchronous and asynchronous models used. Synchronous models allow the transmission of information with real-time interactions through video conferencing systems, whereas asynchronous models involve the transmission of stored or recorded medical images or data onto an internet platform, which is assessed in a separate time frame by a medical provider. Telemedicine increased sharply following the declaration of the COVID-19 pandemic, with dermatologists appearing more likely to implement synchronous compared with asynchronous models.¹ Teledermatology services had been expanding even before the pandemic, and have
been developed over the past decade into effective models to care for common dermatological conditions.\textsuperscript{1–3} The vast majority of prepandemic dermatological research has investigated asynchronous applications of teledermatology, which have consistently reported satisfaction.\textsuperscript{4,5} Given the widespread exposure and essential nature of synchronous teledermatology during the pandemic, we aimed to identify the specific aspects of synchronous teledermatology that enhance and detract from patient and provider satisfaction. The aim of this study was 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 evaluated the likelihood of patients and providers to continue using teledermatology in the future.

**Search strategy**

**Searches**

We searched PubMed for articles published from 1 March 2020 to 1 May 2022. The search terms included, but were not limited to, ‘teledermatology’, ‘patient satisfaction’ and ‘provider satisfaction’. Studies published in English, which 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 the age or sex of the study participants. Studies that used aspects of both synchronous and asynchronous teledermatology (hybrid) were included, whereas studies limited to asynchronous models only (e.g. store-and-forward) were excluded.

**Categorization**

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.

**Assessment of satisfaction**

Studies used various scales to assess satisfaction. Therefore, a standardized set of criteria\textsuperscript{4} 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.\textsuperscript{4}

**Results**

**Studies**

Our review identified 58 potential studies, of which 15 satisfied the inclusion criteria, evaluating quantitative patient satisfaction with synchronous teledermatology. A Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram of the study screening process is presented in Supplementary Fig. S1. The level of evidence for all articles was 3b, except for the study of Chang and Lipner,\textsuperscript{6} which was 2c.

**Patient satisfaction**

Table 2 summarizes our findings on patient satisfaction with synchronous teledermatology. The study

| Points | Example of scales used | Responses demonstrating satisfaction |
|--------|------------------------|-------------------------------------|
| 2      | Yes, no                | Question specific                    |
| 3      | Less preferred, equal preference, more preferred | Equal preference, more preferred |
|        | Easy, neutral, difficult | Easy                                 |
| 4      | Better, as good, worse | Better/as good                       |
|        | Agree, neither, disagree | Question specific                     |
|        | Strongly disagree/disagree/agree/strongly agree | Agree, strongly agree |
|        | Excellent, good, acceptable, poor | Good, excellent                     |
|        | Very satisfied/satisfied, partially satisfied, unsatisfied | Very satisfied, satisfied |
| 5      | Poor, fair, good, very good, excellent | Good, very good, excellent |
|        | Much better, a little better, the same, a little bit worse, much worse | Much better, a little bit better, the same |
|        | Very satisfied, satisfied, average, unsatisfied, very unsatisfied | Very satisfied, satisfied, somewhat satisfied, neutral, somewhat dissatisfied, very dissatisfied |

\textsuperscript{4}In scale.
sample sizes ranged from 14 to 5229 respondents. Of
the satisfaction domains, questions that addressed
quality of care and technical quality were more com-
mon than questions on accessibility, overall satisfac-
tion and patient–provider relationship.

Patients were largely satisfied with aspects of techni-
cal quality, and 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 with face-to-face (F2F) care. However, they
were satisfied with visit preparation and discharge and
with the visit’s ability to address their needs or treat-
ment. Patients were also uniformly satisfied with all
aspects of the patient–provider relationship and acces-
sibility 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 with F2F care, yet the largest study showed
a preference for teledermatology.

Provider satisfaction

Table 3 summarizes the findings on provider satisfac-
tion with synchronous teledermatology. Of the 15
studies, 4 evaluated provider satisfaction. Of the
satisfaction domains assessed, questions that addressed
technical quality and quality of care were most fre-
quently reported, followed by questions on the

---

Table 2 Patient satisfaction with synchronous teledermatology.

| Parameter                                | Reference number |
|------------------------------------------|------------------|
| Study size, n                            | 13 14 15 16 8 17 18 19 20 21 22 23 6 24 25 |
| Overall satisfaction                     | Yes             |
| Technical quality                        |                  |
| Ease of use/comfort                      | Yes             |
| Video/image quality                      | No               |
| Sound quality                            | Yes              |
| Connection                               | Yes              |
| Quality of care                          |                  |
| Visit preparation and discharge          | Yes             |
| Compared with F2F visit                  | Yes             |
| Physical examination                     | No               |
| Needs or treatment addressed             | Yes              |
| Provider–patient relationship            |                  |
| Overall satisfaction                     | Yes              |
| Provider communication                   | Yes              |
| Access                                   |                  |
| Saves time                               | Yes              |
| Visit length                             | Yes              |
| Access to device                         | Yes              |
| Future willingness, %                    | 84 44 92 92 85 91 80 |
| Preference over F2F, %                   | 31 70 24         |

F2F, face-to-face. aSee reference list for details. b‘Yes’ means at least 80% of patients reported a response demonstrating satisfaction (as in Table 1). c‘No’ means that < 80% of patients reported a response not demonstrating satisfaction (as in Table 1).

---

Table 3 Provider satisfaction with synchronous teledermatology.

| Parameter                                | Reference number |
|------------------------------------------|------------------|
| Study size, n                            | 13 14 20 22      |
| Overall satisfaction                     |                  |
| Technical quality                        |                  |
| Ease of use/comfort                      | No               |
| Video/image quality                      | No               |
| Sound quality                            | No               |
| Connection                               | Yes              |
| Quality of care                          |                  |
| Compared with F2F visit                  | No               |
| Needs or treatment addressed             | Yes              |
| Provider–patient relationship            |                  |
| Overall satisfaction                     | No               |
| Access                                   |                  |
| Visit length                             | Yes              |
| Future willingness, %                    | 87 13 58         |

F2F, face-to-face. aSee reference list for details. b‘Yes’ means at least 80% of patients reported a response demonstrating satisfaction (as in Table 1). c‘No’ means that < 80% of patients reported a response not demonstrating satisfaction (as in Table 1).
The level of evidence for the four studies was 3b. The study samples ranged from 6 to 82 providers. One study reported overall provider dissatisfaction, while another reported overall satisfaction; the other two studies did not measure levels of 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 that assessed this.

Within the domain of quality of care, providers were not satisfied with the quality of the teledermatology visit compared with F2F care. However, providers were satisfied with the service’s ability to address patient needs and treatment concerns. One of two studies noted that providers were not satisfied with the patient–provider relationship. One study reported provider satisfaction with length of visit. Provider willingness to use teledermatology in the future varied between the three studies that assessed this.

Discussion

The majority of studies reported future willingness of patients to use synchronous teledermatology. Patients were highly satisfied with the patient–provider relationship and increased access to care, while both patients and providers were satisfied that patient needs were met by the visits.

The virtual physical examination is an aspect of synchronous teledermatology that should be optimized to ensure patient satisfaction. Moore et al. noted that patients with lower satisfaction scores were more likely to experience an unsatisfactory virtual physical examination (P < 0.01), and that patients with lower satisfaction scores were more likely to experience technical difficulties (P < 0.01). As the limitations of a virtual physical examination preclude the use of synchronous teledermatology for all dermatological conditions, individual practices can identify ‘best-fit’ applications and incorporate pre-appointment patient instruction and review of expectations. One survey conducted during the pandemic reported that 96% of providers believed a total body skin examination required an F2F visit, whereas 97% believed acne could be managed through synchronous teledermatology.

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

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

Conclusion

The pandemic revealed the integral role of synchronous teledermatology when healthcare, environmental or personal conflicts prevent F2F care. This review identifies 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 points

- 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 with F2F visits, dermatologists should 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.
Conflict of interest
The authors declare that they have no conflicts of interest.

Funding
None.

Ethics statement
Ethics approval not applicable. The patient provided informed consent for publication of their case details and images.

Data availability
Data are available on request from the corresponding author.

References
1. Kennedy J, Arey S, Hopkins Z et al. Dermatologist perceptions of teledermatology implementation and future use after COVID-19: demographics, barriers, and insights. JAMA Dermatol 2021; 157: 595–7.
2. Yim KM, Florek AG, Oh DH et al. Teledermatology in the United States: an update in a dynamic era. Telemed J E Health 2018; 24: 691–7.
3. Warshaw E, Greer N, Hillman Y et al. Definitions, survey methods, and findings of patient satisfaction studies in teledermatology: a systematic review. Arch Dermatol Res 2021; 313: 205–15.
4. Mounessa JS, Chapman S, Braunberger T et al. A systematic review of satisfaction with teledermatology. J Telemed Telecare 2018; 24: 263–70.
5. Chang M, Lipner S. Disparities in telemedicine satisfaction among older and non-white dermatology patients: a cross-sectional study. J Drugs Dermatol 2022; 21: 210–14.
6. Berman HS, Shi VY, Hsiao JL. Challenges of teledermatology: lessons learned during COVID-19 pandemic. Dermatol Online J 2020; 26: 13030/qt7193305r.
7. Moore B, Washington A, Butt M et al. Patient satisfaction of real-time teledermatology: a cross-sectional survey. Int J Dermatol 2022; 61: e69–71.
8. Tanaka MJ, Oh LS, Martin SD et al. Telemedicine in the era of COVID-19: the virtual orthopaedic examination. J Bone Joint Surg Am 2020; 102: e57.
9. Anderson M. Mobile technology and home broadband 2019. Available at: https://www.pewresearch.org/internet/2019/06/13/mobile-technology-and-home-broadband-2019/ (accessed 8 September 2021).
10. Rodriguez JA, Clark CR, Bates DW. Digital health equity as a necessity in the 21st century cures act era. JAMA 2020; 323: 2381–2.
11. Pew Research Center. Internet/broadband fact sheet 2019. Available at: https://www.pewresearch.org/internet/fact-sheet/internet-broadband (accessed 2 January 2022).
12. Asabor EN, Bunick CG, Cohen JM et al. Patient and physician perspectives on teledermatology at an academic dermatology department amid the COVID-19 pandemic. J Am Acad Dermatol 2021; 84: 158–61.
13. Fluhr JW, Gaeguen A, Legoupil D et al. Teledermatology in times of COVID-19 confinement: comparing patients’ and physicians’ satisfaction by the standardized Brest Teledermatology Questionnaire. Dermatol 2021; 237: 1–6.
14. Hamad J, Fox A, Kammire MS et al. Evaluating the experiences of new and existing teledermatology patients during the COVID-19 pandemic: cross-sectional survey study. JMIIR Dermatol 2021; 4: e25999.
15. Kaunitz G, Yin L, Nagler AR et al. Assessing patient satisfaction with live-interactive teledermatology visits during the COVID-19 pandemic: a survey study. Telemed J E Health 2022; 28: 591–6.
16. Mostafa PIN, Hegazy AA. Dermatological consultations in the COVID-19 era: is teledermatology the key to social distancing? An Egyptian experience. J Dermatol Treat 2022; 33: 910–15.
17. Pearlman RL, Le PB, Brodell RT et al. Evaluation of patient attitudes towards the technical experience of synchronous teledermatology in the era of COVID-19. Arch Dermatol Res 2021; 313: 769–72.
18. Ruggiero A, Megna M, Annunziata MC et al. Teledermatology for acne during COVID-19: high patients’ satisfaction in spite of the emergency. J Eur Acad Dermatol Venereol 2020; 34: e662–3.
19. Handa S, Mehta H, Bishnoi A et al. Teledermatology during the COVID-19 pandemic: experience at a tertiary care centre in North India. Dermatol Ther 2021; 34: e15022.
20. Cheng YW, Wu CY, Wang BC et al. A desperate need for psoriasis health care in remote regions as revealed by a live interactive teledermatology program serving Penghu Islands in Taiwan Strait. Telederm J E Health 2021; 28: 1109–16.
21. Kohn LL, Pickett K, Day JA et al. When is synchronous telehealth acceptable for pediatric dermatology? Pediatr Dermatol 2022; 39: 236–42.
22. Yadav D, Bhatia S, Ramam M et al. Patient perception and satisfaction with a smartphone-based teledermatology service initiated during the COVID-19 pandemic at a tertiary care hospital in North India. Indian J Dermatol Venereol Leprol 2022. https://doi.org/10.25259/IJDDVL_608_2021
23. Shah N, Kassamali B, Lee MS et al. Evaluating patient experience and satisfaction with teledermatology for isotretinoin management: a structured qualitative interview study. J Dermatol Treat 2022. https://doi.org/10.1080/09546634.2022.2062277
24. Yeroushalmi S, Millan SH, Nelson K et al. Patient perceptions and satisfaction with teledermatology during the COVID-19 pandemic: a survey-based study. J Drugs Dermatol 2021; 20: 178–83.
CPD questions

Learning objective

To demonstrate knowledge of applications of synchronous teledermatology and patient and provider satisfaction associated with the service.

Question 1

Which of the following is an example of synchronous teledermatology?

(a) Patient uploads photographs onto platform for provider to view at their convenience.
(b) Patient’s primary care physician sends a photograph of a concerning mole to a dermatologist for evaluation and awaits a written consultation.
(c) Dermatologist sends a dermatopathology slide to a dermatologist in a neighbouring state for a second opinion.
(d) Patient discusses acne treatment through a video-based platform with a dermatologist.
(e) A nurse on an oncology service uses a secure messaging platform to send a photograph of a skin lesion following administration of a chemotherapy medication to a dermatologist.

Question 2

According to a survey conducted by the American Academy of Dermatology, what visit type did dermatologists feel most confident could be managed through synchronous teledermatology?

(a) Bleeding mole.
(b) Full body skin exam.
(c) Concerning lesion.
(d) Rash.
(e) Acne.

Question 3

According to our study, what part of the synchronous teledermatology visit consistently imparted high satisfaction among patients during the COVID-19 pandemic?

(a) Patient–provider relationship.
(b) Access measures.
(c) Virtual physical exam.
(d) Needs or treatment were addressed.
(e) a, b and d.

Question 4

According to our study, what part of the synchronous teledermatology visit most consistently imparted patient dissatisfaction during the COVID-19 pandemic?

(a) Provider communication.
(b) Video quality.
(c) Virtual physical exam.
(d) Time saved.
(e) Discharge instructions.

Question 5

To address patient dissatisfaction with virtual physical examination, what can practices do to optimize this specific aspect of the synchronous teledermatology visit?

(a) Convert to in-person visits only.
(b) Identify best fit applications for the visits.
(c) Switch to an asynchronous platform.
(d) Schedule appointments at the end of the day.
(e) Offer a telephone call instead.

Instructions for answering questions

This learning activity is freely available online at http://www.wileyhealthlearning.com/ced

Users are encouraged to

- Read the article in print or online, paying particular attention to the learning points and any author conflict of interest disclosures.
- Reflect on the article.
- Register or login online at http://www.wileyhealthlearning.com/ced and answer the CPD questions.
- Complete the required evaluation component of the activity.

Once the test is passed, you will receive a certificate and the learning activity can be added to your RCP CPD diary as a self-certified entry.

This activity will be available for CPD credit for 2 years following its publication date. At that time, it will be reviewed and potentially updated and extended for an additional period.
Supporting Information

Additional Supporting Information may be found in the online version of this article:

Supplementary Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram.