

**Teledermatology for medical education in the COVID-19 pandemic context: A systematic review**



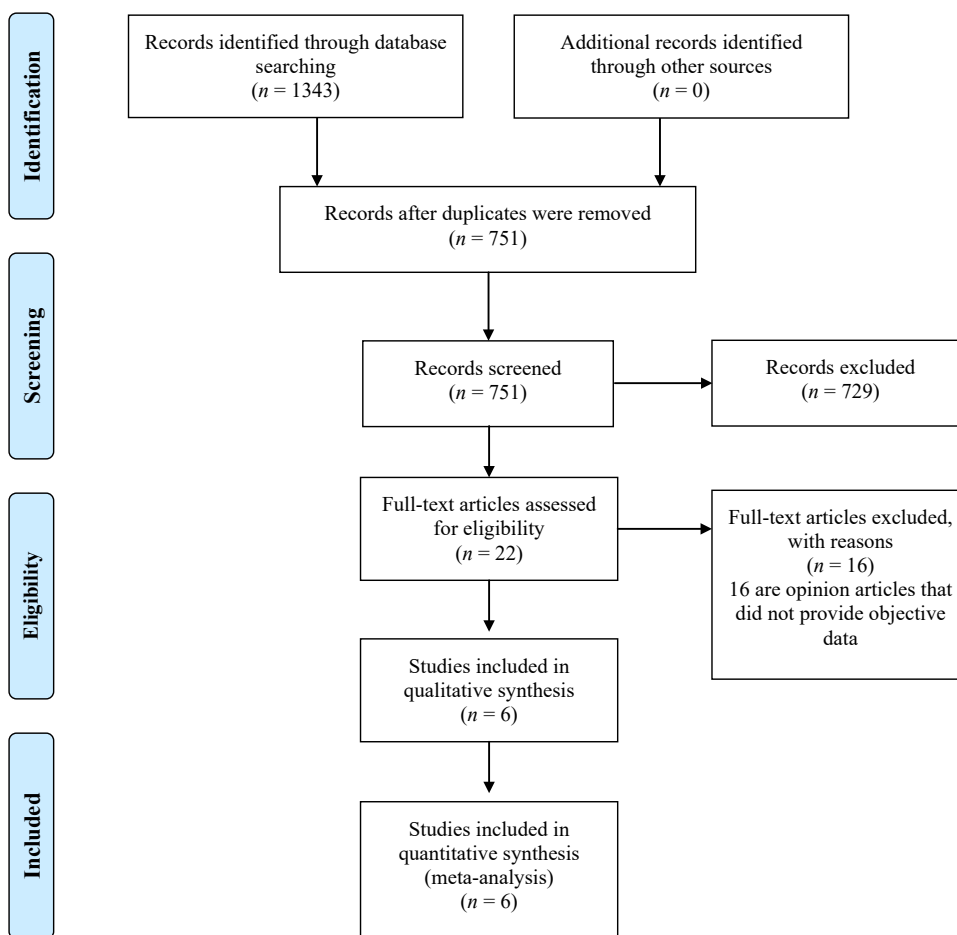
*To the Editor:* The COVID-19 pandemic has caused massive disruptions to medical education around the globe. In order to appreciate how the pandemic has propelled the use of teledermatology (TD) to facilitate medical education, a literature search was conducted from December 1, 2019, to September 1, 2021 (Fig 1). We report 6 studies involving 897 participants that provided objective data on TD for educational purposes (Table 1).

TD in residency programs prior to the pandemic was commonly used in academic medical centers to deliver access to dermatology care to the under-

served communities, including residents of rural remote areas such as the Amazonia. With the pandemic, the use of TD has expanded into almost all areas of dermatology practice.

There has been a proliferation of virtual scientific meetings and faculty-led online teaching for residents during the pandemic. Before the pandemic, 90.3% of scientific meetings were held face-to-face, which drastically reduced to 8.3% during the pandemic.<sup>1</sup> More than 70% of respondents are willing to attend virtual meetings and webinars, and those who did were more likely to be using TD for clinical care.<sup>1</sup>

TD was reported to be beneficial for the education of dermatology residents, who participated in TD



**Fig 1.** Summary of systematic review performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines.

**Table I.** Studies reporting on the use of teledermatology for medical education

Study	Clinical setting/country	Population involved	Number of participants	Mode of delivery	Trainee/faculty/clinicians feedback	Other findings	Limitations of TD
Bhargava et al, 2021 <sup>1</sup>	Worldwide online survey	Participants of 2020 AAD virtual meeting	773	Live webinars and video conferencing for 2020 AAD meeting	70.6% of responders prefer to attend virtual meetings during the pandemic. 80.2% are willing to attend a webinar or other online training during the pandemic. 62% of responders have systems in place to facilitate trainee teaching, and this is mostly commonly delivered via webinars (32.8%).	90.3% of scientific meetings were conducted face-to-face before the pandemic, which dramatically reduced to 8.3% during the pandemic.	38% of responders who were involved in resident teaching before the pandemic did not have any teaching systems in place during the pandemic.
Mahmood et al, 2021 <sup>4</sup>	Online survey, Division of Dermatology, University of Ottawa, Canada	Dermatologists and dermatology residents	42	Virtual consultations	91% of respondents either agreed or strongly agreed that virtual consultations and TD enhanced their residency education and enabled the continuation of training during the pandemic. 91% of residents would like to see TD-based learning incorporated into the dermatology curriculum. 62% dermatologists expressed that TD should be incorporated into the residency curriculum.	35% of faculty incorporated TD it into their teaching during the pandemic; none had done so prior to the pandemic. Use of TD increases accessibility to dermatology services during the pandemic.	Utilization data of TD are only specific to the Department of Dermatology at University of Ottawa, Ontario, Canada.

Continued

Table I. Cont'd

Study	Clinical setting/country	Population involved	Number of participants	Mode of delivery	Trainee/faculty/clinicians feedback	Other findings	Limitations of TD
Lowe et al, 2021	Nationwide online survey, United Kingdom	Dermatology residents	31	Virtual consultations, video conferences with consultants, online learning modules	There has been an increase in trainee confidence levels with the use of TD, with 58% of residents being slightly confident in managing TD compared with 15% from a previous survey before the pandemic. <sup>5</sup> 74% of residents were neutral or unprepared to virtual working during the pandemic. 61% of residents agreed that virtual working would also be beneficial for clinicians, even in the postpandemic era.	100% of residents had conducted virtual consultations during the pandemic.	Video consultations had poor quality image. Perceived lack of dedicated training on use for TD for virtual consultations. Better access to information technology infrastructure required.
Lowe et al, 2020 <sup>5</sup>	Nationwide online survey, United Kingdom	Dermatology residents	26	Not specified	15% of dermatology trainees were slightly confident about using TD. 46% of respondents surveyed having no teaching at all in this area and 96% agreeing that more teaching is required.	Before COVID-19 pandemic, only 26% of dermatology departments in the United Kingdom offered TD virtual consultations; however, this increased to 100% during the COVID 19 pandemic.	Trainees reported the lack of training received in the use of TD due to the lack of senior staff for teaching (38%), poor image quality (27%), and poor availability of local TD services.

Zakaria et al, 2021 <sup>2</sup>	Survey conducted at Zuckerberg San Francisco General Hospital and Trauma Centre, California, United States	Dermatology residents involved in TD referrals	15	Virtual consultations	The use of TD resulted in higher productivity (11.49 cases seen per hour) than face-to-face clinics (4.55 cases seen per hour). TD provided a high caseload, a low-stress learning environment, and opportunities to consider a broad differential diagnosis while developing visual diagnostic and triaging skills.	All participants who responded to the survey provided positive narrative comments. 2 respondents used the word "fun" to describe their TD experiences. 1 respondent commented that the use of TD improved his visual diagnostic skills and "obviates any awkwardness when discussing lesions in front of a patient and allows residents to ask detailed questions about morphology."	The authors concluded that survey respondents may have felt the need to provide positive reviews of the program. There may be limited generalizability be due to differences in electronic record systems and the costs of implementing and integrating TD across different health care settings.
Ali et al, 2021 <sup>3</sup>	Department of Dermatology, University Hospital of Wales, United Kingdom	Dermatology residents	10	Online weekly educational modules combined with a consultant-led virtual interactive session	75% of residents rated that online educational modules combined with tutor-led virtual session were a suitable alternative to traditional face-to-face teaching. 62.5% of residents rated the online teaching slides as "excellent." 88% of residents also reported that the online modules sufficiently supplemented their learning needs to cover the Dermatology JRCPTB curriculum, in addition to regular clinical training.	Residents also reported that ease of accessibility and lower risk of infection as major benefits of TD.	Main limitations include access to technology, internet connectivity, and lower levels of direct engagement between tutor and learner in larger groups.

AAD, American Academy of Dermatology; JRCPTB, Joint Royal Colleges of Physicians Training Board; TD, teledermatology.

consultations followed by formulating an assessment and management plan, which was supervised by an attending dermatologist. Moreover, 91% of Canadian residents reported that TD had added to their education in a positive and meaningful way.<sup>1</sup> TD provided high caseloads in a low-stress learning environment, allowing opportunities to consider broad differential diagnoses while developing visual diagnostic and triage skills.<sup>2</sup> In addition, 75% of the dermatology residents in the United Kingdom reported that the use of online educational modules was a suitable alternative to face-to-face teaching, and 88% of the residents agreed that this sufficiently supplemented their learning requirements.<sup>3</sup>

Furthermore, 91% of Canadian dermatology residents would like to have TD being incorporated into their residency curriculum, an opinion concurred by 62% of their faculty members.<sup>4</sup> Surprisingly, only 35% of faculty had incorporated TD into their resident teaching during the pandemic. This is in direct contrast to a global survey that found that the majority of faculty members had used webinars and virtual rounds to facilitate resident teaching.<sup>1</sup>

In terms of the provision of TD training, Lowe et al<sup>5</sup> reported that dermatology residents in the United Kingdom experienced a deficit in training and limited exposure to TD. Although all United Kingdom dermatology departments surveyed offered TD consultation during the pandemic, 46% of residents reported not receiving any relevant teaching or training.<sup>5</sup> Moreover, 96% of residents surveyed believed that more teaching in TD is required. A subsequent follow-up survey found that 100% of residents surveyed had been involved in TD consultations; 58% of all residents were confident in managing a TD consultation compared with only 15% residents in the previous survey.<sup>5</sup> However, 74% of these residents were neutral or unprepared for virtual working during the pandemic, even though 61% of them agreed that virtual working is beneficial to clinicians. It remains unknown whether the deficit in TD training across the United Kingdom identified previously had been addressed.

In conclusion, TD has enabled the continuation of medication education for residents and fellows during the pandemic, allowing faculty and residents to assess and manage patients remotely, engage in educational activities, and communicate seamlessly with colleagues and faculty. Future efforts may be devoted to incorporating TD into dermatology residency curriculums, expanding the use of TD for

medical education, and providing formal TD training to residents.

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*Funding sources: None.*

*IRB approval status: Institutional review board approval was not required for this study as per the institutional policy of Singapore General Hospital.*

*Key words: COVID-19; dermatology residency; medical education; teledermatology; virtual learning.*

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#### **Conflicts of interest**

None disclosed.

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<https://doi.org/10.1016/j.jdin.2021.12.012>