




# The Role of Teledermatology During the COVID-19 Pandemic: A Narrative Review

Angelo Ruggiero<sup>1</sup> , Fabrizio Martora<sup>1</sup> , Gabriella Fabbrocini<sup>1</sup>, Alessia Villani<sup>1</sup>, Claudio Marasca<sup>1</sup>, Matteo Megna<sup>1</sup>, Luigi Fornaro<sup>1</sup>, Rosita Comune<sup>2</sup>, Luca Potestio<sup>1</sup> 

<sup>1</sup>Section of Dermatology, Department of Clinical Medicine and Surgery, University of Naples Federico II, Naples, Italy; <sup>2</sup>Department of Precision Medicine, University of Campania Luigi Vanvitelli, Naples, Italy

Correspondence: Angelo Ruggiero, Section of Dermatology, Department of Clinical Medicine and Surgery, University of Naples Federico II, Via Pansini, 5, Naples, 80131, Italy, Tel +39 - 081 - 7462457, Fax +39 - 081 - 7462442, Email Angeloruggiero1993@libero.it

**Abstract:** Teledermatology represented one of the most important and useful tools during the COVID-19 pandemic era. Indeed, due to the severe restriction, and to reduce the spread of the infection, different measures were applied among different countries and hospitals to ensure a continuity of care for patients. In this scenario, teledermatology played a central role, especially in the management of patients suffering from chronic inflammatory skin diseases. The aim of this narrative review is to describe the role of teledermatology during the COVID-19 pandemic to analyze main strengths and limitations of this tool, as well as to provide future perspectives in clinical applications.

**Keywords:** teledermatology, telemedicine, COVID-19, psoriasis, atopic dermatitis, hidradenitis suppurativa

## Introduction

The Coronavirus disease 2019 (COVID-19) outbreak represented a worldwide challenge, strongly impacting on overall health, lifestyle and global economy.<sup>1</sup> In order to reduce as much as possible the spread of the infection, several measures have been adopted among different countries to ensure a continuity of care for patients, deeply changing the daily clinical practice approach.<sup>2,3</sup> Among these, the transition from face-to-face visits to teleconsultations was one of the main strategy adopted to reduce the risk of infection, limiting the access to hospital only for severe diseases.<sup>4</sup> With regard to daily dermatological practice, teledermatology represented a useful tool to ensure a continuity of care for patients.<sup>5</sup> Furthermore, several new cutaneous manifestations have been linked to the COVID-19 infections, including COVID-19 related skin diseases, and a worsening of preexisting dermatological conditions, such as of the inflammatory skin diseases.<sup>5</sup> Moreover, dermatologists had to manage patients' hesitancy and doubts about the safety and effectiveness of conventional treatments and biologics in case of infection, the development or worsening of several dermatoses such as acne, rosacea, related to the use of personal protection equipment and the new lifestyle, and the management of inflammatory skin conditions [eg atopic dermatitis (AD), psoriasis, hidradenitis suppurativa (HS)] since their relapsing chronic clinical course strongly affecting patients' quality of life, and requiring a long term follow-up.<sup>6-16</sup>

Telemedicine has been defined by the World Health Organization (WHO) as the

Delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment, and prevention of disease and injuries, research, and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities.<sup>17</sup>

Even if the use of telemedicine has been proposed several years ago, the spreading of COVID-19 allowed a massive and rapid diffusion, and implementation of this service, becoming a valuable weapon during the pandemic era.<sup>17,18</sup> As note, two different types of telemedicine should be distinguished: synchronous (in which patient and clinicians are able to

interact in real-time) and asynchronous (based on a store-and-forward system).<sup>19</sup> The aim of this narrative review is to describe the role of teledermatology during the COVID-19 pandemic in order to analyze main strengths and limitations of this tool, as well as to provide future perspectives in clinical applications.

## Materials and Methods

For the current review, literature research was performed on the PubMed, EBSCO, Embase, Google Scholar, Cochrane Skin, and MEDLINE databases (until October 20, 2022). Research was performed by using and matching the following terms: “COVID-19”, “telemedicine”, “teledermatology”, “skin manifestations”, “cutaneous disease”, “acne”, “psoriasis”, “atopic dermatitis”, “hidradenitis suppurativa”, “urticaria”, “alopecia”, “rosacea”, “eczema”. Investigated manuscripts included metanalyses, reviews, letter to editor, real-life studies, case series and reports. The most relevant articles were considered in this narrative review. Studies were selected if they provided useful information on the use of teledermatology during COVID-19 pandemic. Manuscripts reporting data on the use of teledermatology before COVID-19 pandemic were excluded. Thus, the research was refined by reviewing the texts and the abstracts of considered articles. The bibliography was also analyzed to include articles that could have been missed. Only English language manuscripts were included. This article is based on previously conducted studies and does not contain any studies with human participants or animals performed by any of the authors.

## Results

A total of 132 reports were initially found searching literature. Subsequently, 42 and 11 manuscripts were excluded since they were duplicates and in non-English languages, respectively. Then, literature review was refined following inclusion and exclusion criteria. Finally, a total of 39 articles were selected in the current review.

### Teledermatology, Acne and Hidradenitis Suppurativa

The use of teledermatology for the management of acne and HS has shown to be crucial for the management of these conditions during the COVID-19 pandemic era. Indeed, patients affected by both diseases require personalized therapies and continuous follow-up.<sup>20–24</sup>

As regards acne, several studies have been reported. Indeed, acne was the main field of application of telemedicine during the pandemic and the use of this tool for acne management has been investigated also before COVID-19 period.<sup>25–27</sup>

In a retrospective analysis by Kazi et al, investigating 951 synchronous and 1672 asynchronous acne visits, the authors reported that synchronous teledermatology was statistically significant ( $p < 0.05$ ) preferred to asynchronous one for complex medical dermatology.<sup>28</sup> Similarly, Gu et al<sup>19</sup> investigated the characteristics of 480 acne visits conducted by telemedicine during COVID-19 pandemic showing that topical medications were more commonly prescribed compared with systemics ( $p < 0.05$ ) as well as the authors advised to be careful in using isotretinoin in female subjects because there are not studies assessing the efficacy and safety on the use of this drug using teledermatology.<sup>29</sup> However, recently Moreno-Ramírez et al<sup>20</sup> reported that store-and-forward telemedicine is feasible for the management of acne subjects requiring oral isotretinoin in a longitudinal, prospective, feasibility study.<sup>30</sup> The effectiveness of teledermatological consultations was also analyzed by Lee et al who analyzed 1233 virtual visits showing that non-English speaking subjects were 2.86 times ( $p < 0.001$ ) and elderly patients ( $>60$  years) were 2 times ( $p = 0.020$ ) more likely to have an audio-only than video visit, suggesting the importance of non-video visits as a valuable alternative in these populations.<sup>31</sup> Other strategies of teledermatology for acne patients were reported in literature. Marasca et al<sup>22</sup> showed the effectiveness of Whatsapp supporting group reporting an increased therapeutic adherence and better outcomes in 80 patients receiving reminder for their acne medications compared with patients which did not receive reminders.<sup>32</sup>

All these studies reported telemedicine as an effective and safe option in the management of acne disease, increasing treatment adherence and patients' quality of life, suggesting this tool as a valuable option for acne treatment. Moreover, a high grade of patients' satisfaction has been reported.<sup>20,33–35</sup> Finally, a long-term study on 213 acne patients showed that about 50% of acne patients preferred telemedicine even if in-person visits are allowed.<sup>36</sup>

The use of teledermatology for the management of HS has not been widely investigated. Indeed, fewer studies are available.<sup>37</sup> Patel showed that face-to-face visits are important for the management of HS as compared with tele-visits since HS is an unstable disease and the use of video or photographic assessment should be handled with caution since

intimate body areas are usually involved as well as patients affected by HS have a high prevalence of depression and anxiety.<sup>38</sup> In his study, 41 patients undergoing 73 remote consultations were compared with 40 subjects attending 70 face-to-face visits.<sup>38</sup> Similarly, a survey conducted on Facebook supporting patients' groups for HS, performed by 335 responders, reported that subjects with a severe form of HS disagreed that teledermatology provided equally effective care compared with face-to-face visits.<sup>39</sup>

To sum up, the role of telemedicine in patients affected by HS seems to be limited since several concerns remain such as patient emotional distress, patient comfort and privacy, difficulties to show intimate areas, inability for clinicians to palpate lesions.<sup>40–44</sup> Thus, new strategies and new studies are required.

## Teledermatology and Psoriasis

Psoriasis is a chronic relapsing skin disorder that needs long-term management and frequent follow-ups.<sup>45–47</sup> Even if the introduction of biologic and small molecules revolutionized the management of psoriasis, showing a high grade of effectiveness and safety, also in special populations, the long-term follow-ups to monitor the severity of the disease is still required.<sup>48–53</sup>

Globally, psoriasis represented a burden for patients during COVID-19 pandemic period.<sup>54</sup>

In this scenario, telemedicine showed to be a valuable weapon to ensure therapeutic continuity also during the pandemic.<sup>55</sup> A survey-based study by Gisondi et al<sup>39</sup> including 246 patients affected by chronic plaque psoriasis in stable clinical remission undergoing biologic treatment showed that 118 patients (48%) preferred telemedicine over a face-to-face visit, saving time and reducing the risk of contracting COVID-19 infection.<sup>56</sup> Moreover, a previously reported experience with telemedicine showed patients' preference for tele visits (odds ratio [OR] 10.75; 95% confidence interval [CI] 3.61–32.03), while older age was negatively associated with the preference for telemedicine (OR 0.30; 95% CI 0.10–0.90).<sup>56</sup> The importance of telemedicine for psoriasis management has been confirmed by recent guidelines.<sup>57</sup> The effectiveness of teledermatology for psoriasis management has also been showed by Tinio et al<sup>41</sup> which analyzed 424 charts of patients affected by psoriasis undergoing teledermatological consultation for disease's flare-up, and a follow-up at 1 month, reporting a high level of effectiveness of this tool for the management of psoriasis worsening, and confirming patients' appreciation for this service.<sup>58</sup>

Globally, the use of telemedicine for psoriasis has been also investigated before COVID-19 pandemic, confirming its potential role in these chronic diseases, especially during the pandemic period, due to the restrictive measures adopted.<sup>59–61</sup> Certainly, teledermatology will be a useful weapon for the transition to a personalized approach and the chronic management of psoriatic patients.<sup>62,63</sup>

## Teledermatology and Atopic Dermatitis

AD is one of the most common dermatological inflammatory disease.<sup>64</sup> The early onset in childhood, the chronic-relapsing course, the need for continuous monitoring of the disease severity, and the association with atopic comorbidities make AD an important global public health issue.<sup>65–69</sup> These concerns raised the need for new treatment strategies during the COVID-19 pandemic period, where face-to-face visits were limited.

A recently published retrospective study showed that the accuracy for the diagnosis of AD using telemedicine was 84.4%. Moreover, 72% of the atopic patients were managed by teledermatology, while 28% of them were referred to dermatologists.<sup>70</sup> Other studies reported the effectiveness and safety of telemedicine for AD management, showing this tool as an effective and safe option for atopic patients.<sup>71–74</sup> Finally, the European Academy of Allergy and Clinical Immunology concerning AD proposed telemedicine as useful for therapeutic education, monitoring AD severity (using validated instruments for scoring AD severity), patient communication, medication reminders, and research.<sup>75</sup>

## Teledermatology and Skin Cancers

Skin cancers are the most common type of cancer. In particular, melanoma and non-melanoma skin cancers can be distinguished.<sup>76</sup> Even if several studies reported the reduction in the diagnosis of skin tumors during the pandemic,<sup>77–83</sup> few data are available on their diagnosis and management using telemedicine. Jobbágy et al showed that asynchronous teledermatology was an accurate skin cancer screening system during the first wave of the COVID-19 pandemic, examining 749 patients with 799 lesions using a mobile phone application.<sup>84</sup> Similar results were showed by Ziętek et al which analyzed 80 patients using remote dermatological consultation.<sup>85</sup> Finally, the long-term efficacy of

telemedicine for patients with locally advanced basal cell carcinoma during COVID-19 pandemic has been reported by Villani et al<sup>67</sup> who analyzed 23 patients undergoing treatment with sonidegib, a hedgehog inhibitors,<sup>86</sup> performing monthly follow-ups by telemedicine.<sup>87</sup>

## Teledermatology, Biological Treatments and COVID-19 Vaccination

Biological treatments revolutionized the management of several dermatological inflammatory skin conditions, particularly psoriasis, atopic dermatitis and hidradenitis suppurativa.<sup>47,88–90</sup> In particular, real-life evidence confirmed the safety of these drugs also during COVID-19 pandemic period.<sup>91–93</sup> Unfortunately, even if several articles suggest teledermatology as a valuable option for the long-term management of patients undergoing biological treatment with a stable disease, official guidelines and international recommendations are still lacking. Similarly, few data about the monitoring of cutaneous reactions following COVID-19 vaccination are available.<sup>94–103</sup>

## Limitations of Teledermatology

Although the high value that teledermatology had during the pandemic era, near the several pros highlighted, there are several limitations to this important tool. The results from a survey-based study, involving dermatologists offering teledermatology services, showed both advantages and disadvantages of teledermatology.<sup>104</sup> Particularly, although most of the interviewed dermatologists described teledermatology as an effective tool for patient care, they also described the limitations of teledermatology.<sup>104</sup> Among the described disadvantages, the most frequently reported included the low image quality, the inadequate view of the skin during the video consultations, and several technical issues. Other limitations described were the decreased patient rapport, unrealistic patient expectation to tele-visit, the inability to perform any procedures or through examination, compensation issues.<sup>104</sup> Furthermore, among interviewed dermatologists about 37% reported to believe that teledermatology contributed to their professional burn out during the COVID-19 era.<sup>104</sup> Similar data have been showed by Bhargava et al, who reported teledermatology as one of the most important factor influencing dermatologists burn out during the pandemic.<sup>105</sup> Another important disadvantage of teledermatology is represented by the diseases misdiagnosis. Particularly, although teledermatology gave the opportunity to inspect and diagnose lesions pertinent to the chief complaint, several other lesions that would have been otherwise analyzed and correctly diagnosed, during a complete standard examination may be missed, or otherwise not correctly diagnosed.<sup>106,107</sup> Several studies showed that this may come from a non-adequate use of video or photo during the visit, due to the poor quality of shared clinical image, and/or to the inability of many patients to correctly share and take photos of their lesions, resulting in a difficult differential diagnosis process (ie, missing small/discrete details like small erythematous areas, scales, Pityriasis Folliculorum of the back thoracic area, discrimination between furunculosis/hidrosadenitis, acne/rosacea, small nail signs), and hence in a higher rate of diagnosis error than in person visits.<sup>108–110</sup> These limitations may be the cause of low rate of patients satisfaction, and patients' preference for in person visits than teledermatology.<sup>107</sup>

## Discussion

The WHO definition of telemedicine describes the main aims of this tool.<sup>111</sup> In particular, evading spatial distance, providing clinical assistance remotely, and using new technologies at the service of patients, are the main objectives of teledermatology, with the avoidance of the reduction of the quality of health care as the main one.<sup>112</sup> In our opinion, the aim of telemedicine should also consider other factors related to healthcare system, patients and global situation.

In this scenario, our review highlighted the key role played by teledermatology during the COVID-19 pandemic.<sup>113</sup> Indeed, it allowed the continuity of care in several dermatological conditions, especially chronic skin diseases. Certainly, the need for therapeutic assistance as well as the strategies adopted to prevent the spreading of the infection, led to the need for a personalized telemedical approach. Several strategies were adopted such as boosted online services (eg email, phone calls, video calls) and digital platform support groups, allowing the therapeutic continuity.

As shown in our narrative review, main strengths of telemedicine are the safety, effectiveness, and the high level of satisfaction for both patients and physicians.

Furthermore, some more advantages for using teledermatology in COVID time have been the possibility of diagnosis and treatment of familial clustering of COVID-19 skin manifestations, for isolated families with skin problems, linked to the

rapidity of communication, and direct interaction with physicians.<sup>114</sup> Another important role of tele dermatology during the COVID-19 era has been represented by the inpatient consultations for patients positive to the SarsCov2 infection. Particularly, these tele-visits resulted important for inpatients experiencing both COVID-19 related and non-related diseases, reducing the risk of infection for physicians, and leading to a correct diagnosis of these novel manifestations.<sup>114–116</sup> Unfortunately, several limitations remain. Among these, we want to highlight capacity of using devices, the availability of internet access, the need for high-quality camera and for an app for personal computers and smartphones for the inclusion of photographs. Moreover, severity score indexes should be reevaluated to make them pertinent to telemedicine.

Nowadays, with the reduction of COVID-19 restriction measures, the number of face-to-face visits is increasing. In our opinion, telemedicine is still a useful tool, but its use should be revised.<sup>117</sup> Indeed, it could play a key role in daily clinical practice for patients who, for any reason (eg logistical barriers, living in underserved areas, few availabilities of dermatologists, quarantine measures, personal problems), require medical advice without the possibility of attending a face to face visit. Certainly, patients affected by chronic inflammatory skin disorders undergoing biological treatments, and presenting a stable disease, may be the main candidates for the use of tele dermatology.<sup>118</sup>

Furthermore, the use of telemedicine should be better regulated by official guidelines, and international shared recommendation, especially for the problems of a medico-legal nature (such as informed consent and privacy disclosure), which may impact on the physicians' use of this service. Moreover, to increase the use and appreciation among patients, a well-structured, simply and widely diffused platform should be implemented, to reduce the barriers for elderly patients, as well as to reassure patients about privacy and safe data storage concerns.

Globally, even if tele dermatology is expected to be an integral part of medicine, allowing cost and time-savings both for health system and patients, the physician–patient relationship should not be ignored. This relationship is at the basis of medicine, and it is not present during tele visits. Probably, the association of tele visits with face-to-face consultations may be a valuable option to overcome this limitation.

## Strengths and Limitations

Main strengths of our review are the systematic method during the literature research and the high number of investigated articles. Main limitations include the reduced data on the use of tele dermatology before and after the COVID-19 pandemic period as well as the absence of large cohort disease investigating the effectiveness, feasibility, and safety of this tool in dermatological conditions.

## Conclusion

COVID-19 pandemic period required special measures to avoid the spreading of the infection. Among these, tele dermatology played a key role, showing promising results in terms of effectiveness and safety, allowing the therapeutic continuity also in this period. Nowadays, it is a current reality in daily clinical practice, and it will hold a key role also in the future. Certainly, further studies and improvements are needed to overcome the limitations of this tool, offering patients a tailored tele dermatological management.

## Disclosure

G. Fabbrocini acted as a speaker or consultant for AbbVie, Amgen, Eli Lilly, Janssen, Leo-Pharma, Almirall, Novartis, and UCB. M. Megna acted as a speaker or consultant for AbbVie, Eli Lilly, Janssen, Leo-Pharma, and Novartis. None of the other contributing authors have any conflict of interest, including specific financial interests of relationships and affiliation relevant to the subject matter or discussed materials in the manuscript.

## References

1. Mazinani M, Rude BJ. The novel zoonotic Coronavirus disease 2019 (COVID-19) pandemic: health perspective on the outbreak. *J Healthc Qual Res.* 2021;36(1):47–51. doi:10.1016/j.jhqr.2020.09.004
2. Luo M, Guo L, Yu M, et al. The psychological and mental impact of coronavirus disease 2019 (COVID-19) on medical staff and general public – a systematic review and meta-analysis. *Psychiatry Res.* 2020;291:113190. doi:10.1016/j.psychres.2020.113190
3. De Lucia M, Potestio L, Costanzo L, et al. Scabies outbreak during COVID-19: an Italian experience. *Int J Dermatol.* 2021;60(10):1307–1308. doi:10.1111/ijd.15809



4. Marasca C, Annunziata MC, Camela E, et al. Tele dermatology and inflammatory skin conditions during COVID-19 era: new perspectives and applications. *J Clin Med*. 2022;11(6):1511. doi:10.3390/jcm11061511
5. Annunziata MC, Patri A, Ruggiero A, et al. Cutaneous involvement during COVID-19 pandemic: an emerging sign of infection. *J Eur Acad Dermatol Venereol*. 2020;34(11):e680–e682. doi:10.1111/jdv.16769
6. Villani A, Fabbrocini G, Annunziata MC, et al. Mask prevalence and risk factors during the COVID-19 pandemic. *J Eur Acad Dermatol Venereol*. 2022;36(9):e678–e680. doi:10.1111/jdv.18248
7. Gisoni P, Plaserico S, Bordin C, et al. Cutaneous manifestations of SARS-CoV-2 infection: a clinical update. *J Eur Acad Dermatol Venereol*. 2020;34(11):2499–2504. doi:10.1111/jdv.16774
8. Megna M, Ruggiero A, Marasca C, et al. Biologics for psoriasis patients in the COVID-19 era: more evidence, less fears. *J Dermatolog Treat*. 2020;31(4):328–329. doi:10.1080/09546634.2020.1757605
9. Damiani G, Gironi LC, Grada A, et al. COVID-19 related masks increase severity of both acne (maskne) and rosacea (mask rosacea): multi-center, real-life, telemedical, and observational prospective study. *Dermatol Ther*. 2021;34(2):e14848. doi:10.1111/dth.14848
10. Marasca C, Ruggiero A, Napolitano M, et al. May COVID-19 outbreaks lead to a worsening of skin chronic inflammatory conditions? *Med Hypotheses*. 2020;143:109853. doi:10.1016/j.mehy.2020.109853
11. Campanati A, Martina E, Offidani A. The challenge arising from new knowledge about immune and inflammatory skin diseases: where we are today and where we are going. *Biomedicines*. 2022;10(5):950. doi:10.3390/biomedicines10050950
12. Scalvenzi M, Villani A, Ruggiero A. Community knowledge about the use, reuse, disinfection and disposal of masks and filtering facepiece respirators: results of a study conducted in a dermatology clinic at the university of Naples in Italy. *J Community Health*. 2021;46(4):786–793. doi:10.1007/s10900-020-00952-3
13. Zagaria O, Villani A, Ruggiero A, Potestio L, Fabbrocini G, Gallo L. New-onset lichen planus arising after COVID-19 vaccination. *Dermatol Ther*. 2022;35(5):e15374. doi:10.1111/dth.15374
14. Potestio L, Genco L, Villani A, et al. Reply to ‘cutaneous adverse effects of the available COVID-19 vaccines in India: a questionnaire-based study’ by Bawane J et al. *J Eur Acad Dermatol Venereol*. 2022;36(11):e863–e864. doi:10.1111/jdv.18341
15. Megna M, Ocampo-Garza SS, Potestio L, et al. New-onset psoriatic arthritis under biologics in psoriasis patients: an increasing challenge? *Biomedicines*. 2021;9(10):1482. doi:10.3390/biomedicines9101482
16. Picone V, Fabbrocini G, Martora L, et al. A case of new-onset lichen planus after COVID-19 vaccination. *Dermatol Ther*. 2022;12(3):801–805. doi:10.1007/s13555-022-00689-y
17. Bashshur R, Shannon G, Krupinski E, Grigsby J. The taxonomy of telemedicine. *Telemed J E Health*. 2011;17(6):484–494.
18. Doraiswamy S, Abraham A, Mamtani R, Cheema S. Use of telehealth during the COVID-19 pandemic: scoping review. *J Med Internet Res*. 2020;22(12):e24087. doi:10.2196/24087
19. Villani A, Scalvenzi M, Fabbrocini G. Tele dermatology: a useful tool to fight COVID-19. *J Dermatolog Treat*. 2020;31(4):325. doi:10.1080/09546634.2020.1750557
20. Ruggiero A, Megna M, Annunziata MC, et al. Tele dermatology for acne during COVID-19: high patients’ satisfaction in spite of the emergency. *J Eur Acad Dermatol Venereol*. 2020;34(11):e662–e663. doi:10.1111/jdv.16746
21. Martora F, Marasca C, Fabbrocini G, et al. Strategies adopted in a southern Italian referral centre to reduce adalimumab discontinuation: comment on ‘can we increase the drug survival time of biologic therapies in hidradenitis suppurativa?’ *Clin Exp Dermatol*. 2022;47(10):1864–1865. doi:10.1111/ced.15291
22. Martora F, Picone V, Fabbrocini G, et al. Hidradenitis suppurativa flares following COVID-19 vaccination: a case series. *JAAD Case Rep*. 2022;23:42–45. doi:10.1016/j.jcdr.2022.03.008
23. Ruggiero A, Martora F, Picone V, et al. Paradoxical Hidradenitis Suppurativa during biologic therapy, an emerging challenge: a systematic review. *Biomedicines*. 2022;10(2):455. doi:10.3390/biomedicines10020455
24. Giamarellos-Bourboulis EJ, Bettoli V, Jemec GBE, et al. Anti-COVID-19 measurements for hidradenitis suppurativa patients. *Exp Dermatol*. 2021;30 Suppl 1(Suppl1):18–22. doi:10.1111/exd.14339
25. Singer HM, Almazan T, Craft N, et al. Using Network Oriented Research Assistant (NORA) technology to compare digital photographic with in-person assessment of acne vulgaris. *JAMA Dermatol*. 2018;154(2):188–190. doi:10.1001/jamadermatol.2017.5141
26. Frühauf J, Kröck S, Quehenberger F, et al. Mobile tele dermatology helping patients control high-need acne: a randomized controlled trial. *J Eur Acad Dermatol Venereol*. 2015;29(5):919–924. doi:10.1111/jdv.12723
27. Khosravi H, Zhang S, Siripong N, Moorhead A, English JC. Comparing acne follow-up: tele dermatology versus outpatient dermatology visits. *Dermatol Online J*. 2020;26(4). doi:10.5070/D3264048339
28. Kazi R, Evankovich MR, Liu R, et al. Utilization of asynchronous and synchronous tele dermatology in a large health care system during the COVID-19 pandemic. *Telemed J E Health*. 2021;27(7):771–777.
29. Gu L, Diaz SM, Lipner SR. Retrospective study of acne telemedicine and in-person visits at an academic center during the COVID-19 pandemic. *J Cosmet Dermatol*. 2022;21(1):36–38. doi:10.1111/jocd.14606
30. Moreno-Ramírez D, Duarte-Ferreras MA, Ojeda-Vila T, et al. Telemedicine management of systemic therapy with isotretinoin of patients with moderate-to-severe acne during the COVID-19 pandemic: a longitudinal prospective feasibility study. *J Am Acad Dermatol*. 2022;87(5):1186–1189. doi:10.1016/j.jaad.2022.03.004
31. Lee MS, Kassamali B, Shah N, LaChance A, Nambudiri VE. Differences in virtual care utilization for acne by vulnerable populations during the COVID-19 pandemic: a retrospective review. *J Am Acad Dermatol*. 2021;85(3):718–719. doi:10.1016/j.jaad.2021.05.008
32. Marasca C, Ruggiero A, Fontanella G, et al. Telemedicine and support groups could be used to improve adherence to treatment and health-related quality of life in patients affected by inflammatory skin conditions during the COVID-19 pandemic. *Clin Exp Dermatol*. 2020;45(6):749. doi:10.1111/ced.14245
33. Villani A, Annunziata MC, Abategiovanni L, et al. Tele dermatology for acne patients: how to reduce face-to-face visits during COVID-19 pandemic. *J Cosmet Dermatol*. 2020;19(8):1828. doi:10.1111/jocd.13519
34. Ruggiero A, Megna M, Fabbrocini G, et al. Video and telephone tele dermatology consultations during COVID-19 in comparison: patient satisfaction, doubts and concerns. *Clin Exp Dermatol*. 2022;47(10):1863–1864. doi:10.1111/ced.15286

35. Martora F, Ruggiero A, Fabbrocini G, et al. Patient satisfaction with remote dermatology consultations during the COVID-19 pandemic. Comment on 'A qualitative assessment of patient satisfaction with remote dermatology consultations used during the UK's first wave of the COVID-19 pandemic in a single, secondary-care dermatology department'. *Clin Exp Dermatol*. 2022;47(11):2037–2038. doi:10.1111/ced.15326
36. Villani A, Annunziata MC, Megna M, et al. Long-term results of teledermatology for acne patients during COVID-19 pandemic. *J Cosmet Dermatol*. 2022;21(4):1356–1357. doi:10.1111/jocd.14805
37. Ruggiero A, Marasca C, Fabbrocini G, et al. Teledermatology in the management of hidradenitis suppurativa: should we improve this service? *J Cosmet Dermatol*. 2022. doi:10.1111/jocd.15292
38. Patel NP. Remote consultations for patients with hidradenitis suppurativa during the COVID-19 pandemic: a single-centre experience. *Clin Exp Dermatol*. 2021;46(6):1079–1081. doi:10.1111/ced.14687
39. Kang N-YC, Hsiao J, Shi V, et al. Remote management of hidradenitis suppurativa in a pandemic era of COVID-19. *Int J Dermatol*. 2020;59(9):e318–e320. doi:10.1111/ijd.15022
40. Okeke CAV, Shipman WD, Perry JD, et al. Treating hidradenitis suppurativa during the COVID-19 pandemic: teledermatology exams of sensitive body areas. *J Dermatolog Treat*. 2022;33(2):1163–1164. doi:10.1080/09546634.2020.1781042
41. Martora F, Marasca C, Battista T, et al. Management of patients with hidradenitis suppurativa during COVID-19 vaccination: an experience from southern Italy. Comment on: 'Evaluating the safety and efficacy of COVID-19 vaccination in patients with hidradenitis suppurativa'. *Clin Exp Dermatol*. 2022;47(11):2026–2028. doi:10.1111/ced.15306
42. Pakhchanian H, Raiker R, DeYoung C, Yang S. Evaluating the safety and efficacy of COVID-19 vaccination in patients with hidradenitis suppurativa. *Clin Exp Dermatol*. 2022;47(6):1186–1188. doi:10.1111/ced.15090
43. Martora F, Martora L, Fabbrocini G, et al. A case of pemphigus vulgaris and Hidradenitis suppurativa: may systemic steroids be considered in the standard management of hidradenitis suppurativa? *Skin Appendage Disord*. 2022;8(3):265–268. doi:10.1159/000521712
44. Naik HB, Alhusayen R, Frew J, et al. Biologic therapy is not associated with increased COVID-19 severity in patients with hidradenitis suppurativa: initial findings from the global hidradenitis suppurativa COVID-19 registry. *J Am Acad Dermatol*. 2022;86(1):249–252. doi:10.1016/j.jaad.2021.09.016
45. Dahy A, El-Qushayri AE, Mahmoud AR, et al. Telemedicine approach for psoriasis management, time for application? A systematic review of published studies. *Dermatol Ther*. 2020;33(6):e13908. doi:10.1111/dth.13908
46. Ruggiero A, Fabbrocini G, Cinelli E, et al. Real world practice indirect comparison between guselkumab and risankizumab: results from an Italian retrospective study. *Dermatol Ther*. 2022;35(1):e15214. doi:10.1111/dth.15214
47. Megna M, Ruggiero A, Camela E, et al. A case of erythrodermic psoriasis successfully treated with guselkumab. *Dermatol Ther*. 2020;33(2):e13238. doi:10.1111/dth.13238
48. Megna M, Potestio L, Ruggiero A, et al. Guselkumab is efficacious and safe in psoriasis patients who failed anti-IL17: a 52-week real-life study. *J Dermatolog Treat*. 2022;33(5):2560–2564. doi:10.1080/09546634.2022.2036674
49. Reid C, Griffiths CEM. Psoriasis and treatment: past, present and future aspects. *Acta Derm Venereol*. 2020;100(3):adv00032. doi:10.2340/00015555-3386
50. Megna M, Tommasino N, Potestio L, et al. Real-world practice indirect comparison between guselkumab, risankizumab, and tildrakizumab: results from an Italian 28-week retrospective study. *J Dermatolog Treat*. 2022;33(6):2813–2820. doi:10.1080/09546634.2022.2081655
51. Megna M, Potestio L, Fabbrocini G, et al. Treating psoriasis in the elderly: biologics and small molecules. *Expert Opin Biol Ther*. 2022;1–18. doi:10.1080/14712598.2022.2089020
52. Ruggiero A, Potestio L, Camela E, et al. Bimekizumab for the treatment of psoriasis: a review of the current knowledge. *Psoriasis*. 2022;12:127–137. doi:10.2147/PTT.S367744
53. Megna M, Potestio L, Fabbrocini G, Cinelli E. Tildrakizumab: a new therapeutic option for erythrodermic psoriasis? *Dermatol Ther*. 2021;34(5):e15030. doi:10.1111/dth.15030
54. Mahil SK, Yates M, Yiu ZZN, et al. Describing the burden of the COVID-19 pandemic in people with psoriasis: findings from a global cross-sectional study. *J Eur Acad Dermatol Venereol*. 2021;35(10):e636–e640. doi:10.1111/jdv.17450
55. Villani A, Megna M, Scalvenzi M, et al. Teledermatology and chronic skin diseases: real life experience in a Southern Italian dermatologic centre. *Dermatol Ther*. 2020;33(6):e13839. doi:10.1111/dth.13839
56. Gisondi P, Bellinato F, Piaserico S, et al. Preference for telemedicine versus in-person visit among patients with psoriasis receiving biological drugs. *Dermatol Ther*. 2021;11(4):1333–1343. doi:10.1007/s13555-021-00555-3
57. Chat VS, Uppal SK, Kearns DG, et al. Clinical management of psoriasis patients during the COVID-19 pandemic. *J Dermatolog Treat*. 2022;33(2):1166–1167. doi:10.1080/09546634.2020.1781045
58. Tinio PA, Melendres JM, Chavez CP, et al. Clinical profile and response to treatment of patients with psoriasis seen via teledermatology during the COVID-19 pandemic in the Philippines. *JAAD Int*. 2022;7:35–37. doi:10.1016/j.jdin.2022.02.001
59. Ford AR, Gibbons CM, Torres J, et al. Access to dermatological care with an innovative online model for psoriasis management: results from a randomized controlled trial. *Telemed J E Health*. 2019;25(7):619–627.
60. Balato N, Megna M, Di Costanzo L, Balato A, Ayala F. Educational and motivational support service: a pilot study for mobile-phone-based interventions in patients with psoriasis. *Br J Dermatol*. 2013;168(1):201–205. doi:10.1111/j.1365-2133.2012.11205.x
61. Fröhau J, Schwantzer G, Ambros-Rudolph CM, et al. Pilot study using teledermatology to manage high-need patients with psoriasis. *Arch Dermatol*. 2010;146(2):200–201. doi:10.1001/archdermatol.2009.375
62. Camela E, Potestio L, Fabbrocini G, et al. New frontiers in personalized medicine in psoriasis [published online ahead of print, 2022 Aug 16]. *Expert Opin Biol Ther*. 2022;2022:1–3.
63. Camela E, Potestio L, Ruggiero A, et al. Towards personalized medicine in psoriasis: current progress. *Psoriasis*. 2022;12:231–250. doi:10.2147/PTT.S328460
64. Weidinger S, Novak N. Atopic dermatitis. *Lancet*. 2016;387(10023):1109–1122. doi:10.1016/S0140-6736(15)00149-X
65. Napolitano M, Ruggiero A, Fontanella G, et al. New emergent therapies for atopic dermatitis: a review of safety profile with respect to female fertility, pregnancy, and breastfeeding. *Dermatol Ther*. 2021;34(1):e14475. doi:10.1111/dth.14475
66. Nutten S. Atopic dermatitis: global epidemiology and risk factors. *Ann Nutr Metab*. 2015;66(Suppl 1):8–16. doi:10.1159/000370220

67. Napolitano M, Maffei M, Patruno C, et al. Dupilumab effectiveness for the treatment of patients with concomitant atopic dermatitis and chronic rhinosinusitis with nasal polyposis. *Dermatol Ther.* 2021;34(6):e15120. doi:10.1111/dth.15120
68. Patruno C, Potestio L, Napolitano M. Clinical phenotypes of adult atopic dermatitis and related therapies. *Curr Opin Allergy Clin Immunol.* 2022;22(4):242–249. doi:10.1097/ACI.0000000000000837
69. Cantelli M, Martora F, Patruno C, et al. Upadacitinib improved alopecia areata in a patient with atopic dermatitis: a case report. *Dermatol Ther.* 2022;35(4):e15346. doi:10.1111/dth.15346
70. Giavina-Bianchi M, Giavina-Bianchi P, Santos AP, et al. Accuracy and efficiency of telemedicine in atopic dermatitis. *JAAD Int.* 2020;1(2):175–181. doi:10.1016/j.jdin.2020.08.002
71. Izquierdo-Domínguez A, Rojas-Lechuga MJ, Alobid I, et al. Management of allergic diseases during COVID-19 outbreak. *Curr Allergy Asthma Rep.* 2021;21(2):8. doi:10.1007/s11882-021-00989-x
72. Ragamin A, de Wijs LEM, Hijnen D-J, et al. Care for children with atopic dermatitis in the Netherlands during the COVID-19 pandemic: lessons from the first wave and implications for the future. *J Dermatol.* 2021;48(12):1863–1870. doi:10.1111/1346-8138.16130
73. Schmid-Grendelmeier P, Takaoka R, Ahogo KC, et al. Position statement on atopic dermatitis in Sub-Saharan Africa: current status and roadmap. *J Eur Acad Dermatol Venereol.* 2019;33(11):2019–2028. doi:10.1111/jdv.15972
74. Patruno C, Nisticò SP, Fabbrocini G, et al. COVID-19, quarantine, and atopic dermatitis. *Med Hypotheses.* 2020;143:109852. doi:10.1016/j.mehy.2020.109852
75. Matricardi PM, Dramburg S, Alvarez-Perea A, et al. The role of mobile health technologies in allergy care: an EAACI position paper. *Allergy.* 2020;75(2):259–272. doi:10.1111/all.13953
76. Villani A, Potestio L, Fabbrocini G, et al. The treatment of advanced melanoma: therapeutic update. *Int J Mol Sci.* 2022;23(12):6388. doi:10.3390/ijms23126388
77. Ruggiero A, Martora F, Fornaro L, et al. The impact of COVID –19 pandemic on nonmelanoma skin cancers: report of a Southern Italy referral centre. *Clin Exp Dermatol.* 2022;47(11):2024–2025. doi:10.1111/ced.15307
78. Villani A, Scalvenzi M, Fabbrocini G, et al. Effects of COVID-19 pandemic on malignant melanoma diagnosis. *J Eur Acad Dermatol Venereol.* 2022. doi:10.1111/jdv.18545
79. Andrew TW, Alrawi M, Lovat P. Reduction in skin cancer diagnoses in the UK during the COVID-19 pandemic. *Clin Exp Dermatol.* 2021;46(1):145–146. doi:10.1111/ced.14411
80. Rashid S, Tsao H. Effect of the COVID-19 pandemic on delayed skin cancer services. *Dermatol Clin.* 2021;39(4):627–637. doi:10.1016/j.det.2021.05.015
81. Asai Y, Nguyen P, Hanna TP, Picardo M. Impact of the COVID-19 pandemic on skin cancer diagnosis: a population-based study. *PLoS One.* 2021;16(3):e0248492. doi:10.1371/journal.pone.0248492
82. Earnshaw CH, Hunter HJA, McMullen E, et al. Reduction in skin cancer diagnosis, and overall cancer referrals, during the COVID-19 pandemic. *Br J Dermatol.* 2020;183(4):792–794. doi:10.1111/bjd.19267
83. Ruggiero A, Martora F, Fornaro F, et al. Reply to ‘Impact of the French COVID –19 pandemic lockdown on newly diagnosed melanoma delay and severity’ by R. Molinier et al. *J Eur Acad Dermatol Venereol.* 2022. doi:10.1111/jdv.18512
84. Jobbágy A, Kiss N, Meznerics FA, et al. Emergency use and efficacy of an asynchronous teledermatology system as a novel tool for early diagnosis of skin cancer during the first wave of COVID-19 pandemic. *Int J Environ Res Public Health.* 2022;19(5):2699. doi:10.3390/ijerph19052699
85. Ziętek M, Nowacki M, Wierzbicki J, et al. The report and analysis concerning the usefulness of basic telemedicine tools in the skin cancer diagnostic screening process during COVID-19 pandemics. *Postepy Dermatol Alergol.* 2022;39(1):189–194. doi:10.5114/ada.2022.113605
86. Villani A, Potestio L, Fabbrocini G, et al. New emerging treatment options for advanced basal cell carcinoma and squamous cell carcinoma. *Adv Ther.* 2022;39(3):1164–1178. doi:10.1007/s12325-022-02044-1
87. Villani A, Potestio L, Fabbrocini G, et al. Long-term efficacy of telemedicine for patients with locally advanced basal cell carcinoma during COVID-19 pandemic. *Dermatol Ther.* 2022;35(11):e15786. doi:10.1111/dth.15786
88. Megna M, Potestio L, Ruggiero A, et al. Risankizumab treatment in psoriasis patients who failed anti-IL17: a 52-week real-life study. *Dermatol Ther.* 2022;35(7):e15524. doi:10.1111/dth.15524
89. Megna M, Cinelli E, Gallo L, et al. Risankizumab in real life: preliminary results of efficacy and safety in psoriasis during a 16-week period. *Arch Dermatol Res.* 2022;314(6):619–623. doi:10.1007/s00403-021-02200-7
90. Ruggiero A, Picone V, Martora F, et al. Guselkumab, risankizumab, and tildrakizumab in the management of psoriasis: a review of the real-world evidence. *Clin Cosmet Investig Dermatol.* 2022;15:1649–1658. doi:10.2147/CCID.S364640
91. Ruggiero A, Martora F, Picone V, et al. The impact of COVID-19 infection on patients with psoriasis treated with biologics: an Italian experience. *Clin Exp Dermatol.* 2022;47(12):2280–2282. doi:10.1111/ced.15336
92. Napolitano M, Patruno C, Ruggiero A, et al. Safety of dupilumab in atopic patients during COVID-19 outbreak. *J Dermatolog Treat.* 2022;33(1):600–601. doi:10.1080/09546634.2020.1771257
93. Ebrahimi A, Sayad B, Rahimi Z. COVID-19 and psoriasis: biologic treatment and challenges. *J Dermatolog Treat.* 2022;33(2):699–703. doi:10.1080/09546634.2020.1789051
94. Martora F, Villani A, Marasca C, et al. Skin reaction after SARS-CoV-2 vaccines reply to ‘cutaneous adverse reactions following SARS-CoV-2 vaccine booster dose: a real-life multicentre experience’. *J Eur Acad Dermatol Venereol.* 2022. doi:10.1111/jdv.18531
95. Potestio L, Villani A, Fabbrocini G, et al. Cutaneous reactions following booster dose of COVID-19 mRNA vaccination: what we should know? *J Cosmet Dermatol.* 2022. doi:10.1111/jocd.15331
96. Martora F, Villani A, Battista T, et al. COVID-19 vaccination and inflammatory skin diseases. *J Cosmet Dermatol.* 2022. doi:10.1111/jocd.15414
97. Wang C-S, Chen -H-H, Liu S-H. Pityriasis rosea-like eruptions following COVID-19 mRNA-1273 vaccination: a case report and literature review. *J Formos Med Assoc.* 2022;121(5):1003–1007. doi:10.1016/j.jfma.2021.12.028
98. Martora F, Picone V, Fornaro L, et al. Can COVID-19 cause atypical forms of pityriasis rosea refractory to conventional therapies? *J Med Virol.* 2022;94(4):1292–1293. doi:10.1002/jmv.27535



99. Martora F, Fabbrocini G, Nappa P, et al. Reply to 'development of severe pemphigus vulgaris following SARS-CoV -2 vaccination with BNT162b2' by Solimani et al. *J Eur Acad Dermatol Venereol.* **2022**;36(10):e750–e751. doi:10.1111/jdv.18302
100. Picone V, Martora F, Fabbrocini G, Marano L. "Covid arm": abnormal side effect after moderna COVID-19 vaccine. *Dermatol Ther.* **2022**;35(1):e15197. doi:10.1111/dth.15197
101. Martora F, Fabbrocini G, Marasca C. Pityriasis rosea after moderna mRNA-1273 vaccine: a case series. *Dermatol Ther.* **2022**;35(2):e15225. doi:10.1111/dth.15225
102. Falcinelli F, Lamberti A, Cota C, Rubegni P, Cinotti E. Reply to 'development of severe pemphigus vulgaris following SARS-CoV-2 vaccination with BNT162b2' by Solimani F et al. *J Eur Acad Dermatol Venereol.* **2022**;36(12):e976–e978. doi:10.1111/jdv.18398
103. Drago F, Broccolo F, Ciccarese G. Pityriasis rosea, pityriasis rosea-like eruptions, and herpes zoster in the setting of COVID-19 and COVID-19 vaccination. *Clin Dermatol.* **2022**;40(5):SS0738–5. doi:10.1016/j.clindermatol.2022.01.002
104. Shah P, Dorrell DN, Feldman SR, et al. The impact of tele dermatology during the COVID-19 pandemic. *Dermatol Online J.* **2021**;27(10). doi:10.5070/D3271055615
105. Bhargava S, Sarkar R, Kroumpouzou G. Mental distress in dermatologists during COVID-19 pandemic: assessment and risk factors in a global, cross-sectional study. *Dermatol Ther.* **2020**;33(6):e14161. doi:10.1111/dth.14161
106. Sendagorta E, Servera G, Nuño A, et al. Direct-to-patient tele dermatology during COVID-19 lockdown in a health district in Madrid, Spain: the EVIDE-19 pilot study. *Actas Dermosifiliogr.* **2021**;112(4):345–353. doi:10.1016/j.ad.2020.11.020
107. Deacon DC, Madigan LM. Inpatient tele dermatology in the era of COVID-19 and the importance of the complete skin examination. *JAAD Case Rep.* **2020**;6(10):977–978. doi:10.1016/j.jder.2020.07.050
108. Pearlman RL, Le PB, Brodell RT, et al. Evaluation of patient attitudes towards the technical experience of synchronous tele dermatology in the era of COVID-19. *Arch Dermatol Res.* **2021**;313(9):769–772. doi:10.1007/s00403-020-02170-2
109. Haque W, Chandy R, Ahmadzade M, et al. Tele dermatology after COVID-19: key challenges ahead. *Dermatol Online J.* **2021**;27(4):13030/qt5xr0n44p. doi:10.5070/D3274053151
110. Choi E, Mak WK, Law JY, et al. Optimizing tele dermatology: looking beyond the COVID-19 pandemic. *Int J Dermatol.* **2021**;60(1):119–121. doi:10.1111/ijd.15272
111. Ekeland AG, Bowes A, Flottorp S. Effectiveness of telemedicine: a systematic review of reviews. *Int J Med Inform.* **2010**;79(11):736–771. doi:10.1016/j.ijmedinf.2010.08.006
112. Pasquali P, Sonthalia S, Moreno-Ramirez D, et al. Tele dermatology and its current perspective. *Indian Dermatol Online J.* **2020**;11(1):12–20. doi:10.4103/idoj.IDOJ\_241\_19
113. Marasca C, Ruggiero A, Annunziata MC, et al. Face the COVID-19 emergency: measures applied in an Italian dermatologic clinic. *J Eur Acad Dermatol Venereol.* **2020**;34(6):e249. doi:10.1111/jdv.16476
114. Gabel CK, Nguyen E, Karmouta R, et al. Use of tele dermatology by dermatology hospitalists is effective in the diagnosis and management of inpatient disease. *J Am Acad Dermatol.* **2021**;84(6):1547–1553. doi:10.1016/j.jaad.2020.04.171
115. Altunisik N, Turkmen D, Calikoglu E, et al. Views and experiences of dermatologists in Turkey about tele dermatology during the COVID-19 pandemic. *J Cosmet Dermatol.* **2020**;19(10):2460–2463. doi:10.1111/jocd.13677
116. Georgesen C, Karim SA, Liu R, et al. Inpatient eDermatology (tele dermatology) can help meet the demand for inpatient skin disease. *Telemed J E Health.* **2020**;26(7):872–878. doi:10.1089/tmj.2019.0147
117. Megna M, Camela E, Villani A, et al. Tele dermatology: a useful tool also after COVID-19 era? *J Cosmet Dermatol.* **2022**;21(6):2309–2310. doi:10.1111/jocd.14938
118. Martora F, Fabbrocini G, Nappa P, et al. Impact of the COVID -19 pandemic on hospital admissions of patients with rare diseases: an experience of a Southern Italy referral center. *Int J Dermatol.* **2022**;61(7):e237–e238. doi:10.1111/ijd.16236

## Clinical, Cosmetic and Investigational Dermatology

Dovepress

### Publish your work in this journal

Clinical, Cosmetic and Investigational Dermatology is an international, peer-reviewed, open access, online journal that focuses on the latest clinical and experimental research in all aspects of skin disease and cosmetic interventions. This journal is indexed on CAS. The manuscript management system is completely online and includes a very quick and fair peer-review system, which is all easy to use. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <https://www.dovepress.com/clinical-cosmetic-and-investigational-dermatology-journal>