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## Quality of life measurement in teledermatology: position statement of the European Academy of Dermatology and Venereology Task Forces on Quality of Life and Patient Oriented Outcomes and Teledermatology

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## POSITION STATEMENT

# Quality of life measurement in teledermatology. Position statement of the European Academy of Dermatology and Venereology Task Forces on Quality of Life and Patient Oriented Outcomes and Teledermatology

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### Abstract

Many events, including the COVID-19 pandemic, have accelerated the implementation of teledermatology pathways within dermatology departments and across healthcare organizations. Quality of Life (QoL) assessment in dermatology is also a rapidly developing field with a gradual shift from theory to practice. The purpose of this paper organized jointly by the European Academy of Dermatology and Venereology (EADV) Task Force (TF) on QoL and patient-oriented outcomes and the EADV TF on teledermatology is to present current knowledge about QoL assessment during the use of teledermatology approaches, including data on health-related (HR) QoL instruments used in teledermatology, comparison of influence of different treatment methods on HRQoL after face-to-face and teledermatology consultations and to make practical recommendations concerning the assessment of QoL in teledermatology. The EADV TFs made the following position statements: HRQoL assessment may be an important part in most of teledermatology activities; HRQoL assessment may be easily and effectively performed during teledermatology consultations. It is especially important to monitor HRQoL of patients with chronic skin diseases during lockdowns or in areas where it is difficult to reach a hospital for face-to-face consultation; regular assessment of HRQoL of patients with skin diseases during teledermatology consultations may help to monitor therapy efficacy and visualize individual patient's needs; we recommend the use of the DLQI in teledermatology, including the use of the DLQI app which is available in seven languages; it is important to develop apps for dermatology-specific HRQoL instruments for use in children (for example the CDLQI and InToDermQoL) and for disease-specific instruments.

## INTRODUCTION

Teledermatology can be defined as the practice of dermatology remotely. It uses digital technology to exchange clinical information and images to support patient care.<sup>1</sup> Teledermatology was originally developed to supply a diagnostic program and/or therapeutic management to patients living at a distance or to elderly patients who were unable to travel (i.e. teliagnosis, telecare), where face-to-face consultations were impossible to organize. It was then extended for use in research as well as for educational purposes. Teledermatology can be used in the diagnosis and monitoring of different skin diseases.<sup>2,3</sup> It can be used to support all stages of the patient journey, ranging from self-care and community management to triage to the correct hospital service, tertiary care and long-term monitoring and follow up. Many events, including the COVID-19 pandemic, have accelerated the implementation of teledermatology pathways within dermatology services and across healthcare organizations worldwide.<sup>1</sup>

There are also several limitations concerning the use of teledermatology. Among these are loss of face-to-face interaction and communication between patient and dermatologist, loss of ability to palpate the skin and variation in access to digital technology. There may also be legal issues, varying from country to country, relating to where medicine is allowed to be practised and other potential legal issues in the case of malpractice.<sup>1</sup>

Quality of Life (QoL) assessment in dermatology is also a rapidly developing field with a gradual shift from theory to practice.<sup>4</sup> Teledermatologic consultation can be a valuable tool to monitor the QoL of patients affected by chronic skin diseases and who may require monitoring.<sup>5,6</sup> Where short follow up times for visits would be impossible for these patients due to logistic or age reasons, the use of teledermatology consultations may guarantee continuity of care, ensuring better disease management and, consequently, reducing the impairment of health-related (HR) QoL. Teledermatology consultations were particularly important during the COVID-19 pandemic, not only for investigating and managing skin disease but also because of their possible beneficial effect on HRQoL.<sup>7,8</sup> A 2015 literature review stated that teledermatology interventions do result in improved QoL, and those changes correlate with improvements in disease severity and clinical course.<sup>9</sup>

The purpose of this paper, organized jointly by the European Academy of Dermatology and Venereology (EADV) Task Force (TF) on QoL and patient-oriented outcomes and the EADV TF on teledermatology, is to present current knowledge about QoL assessment during the use of teledermatology approaches, including data on HRQoL instruments used in teledermatology, comparison of the influence of different treatment methods on HRQoL after face-to-face and teledermatology consultations and to make practical recommendations concerning the assessment of QoL in teledermatology.

## METHODS

Members of the EADV TFs on QoL and patient-oriented outcomes and teledermatology were invited to participate. A literature search was performed using the PubMed database, which was searched from the beginning to March 2023 using the key word combination: 'teledermatology, quality of life'. All publications written in English or those having English abstracts were considered.

Exclusion criteria:

- Review articles, guidelines, protocols.
- Studies without HRQoL assessment.
- Studies without teledermatology.

Identified review articles were searched for important additional references. The remaining publications were analysed in detail and the QoL instruments used in teledermatology were listed.

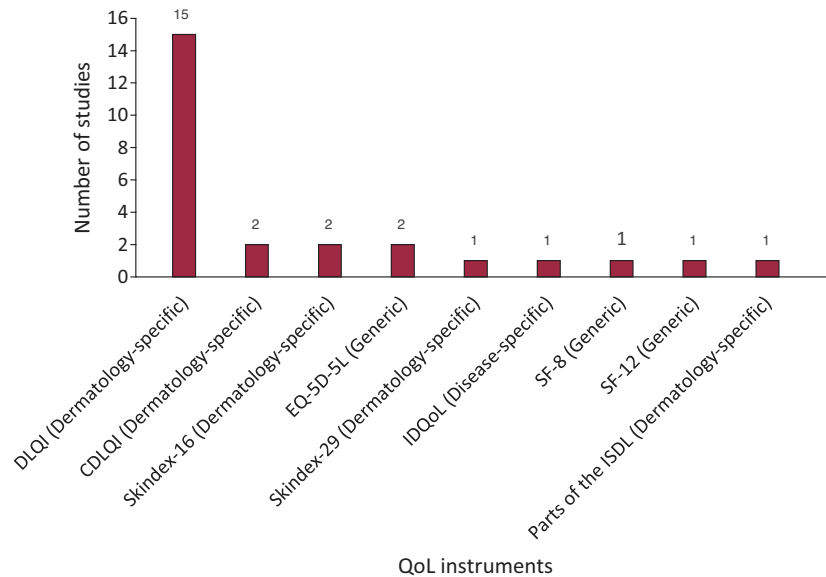
## RESULTS

From the 52 articles identified in the literature search, 33 were excluded based on the exclusion criteria, leaving 19 publications, where HRQoL was assessed in teledermatology, for the further analysis. Three generic, five dermatology-specific and one atopic dermatitis-specific HRQoL instruments were used in these studies.<sup>6,7,10-26</sup> The dermatology life quality index (DLQI) was used in 15 studies. Other instruments were used once or twice (Figure 1). Brief description and main results of included studies are presented in Table 1.

### Effect of teledermatology on HRQoL

Patients attending teledermatology clinics at two rural hospitals in Jordan were interviewed at their initial visit and after 8 weeks.<sup>11</sup> The mean Short Form (SF)-8 score increased significantly and the mean DLQI score decreased significantly ( $p < 0.005$ ) indicating that there had been an improvement in patients' HRQoL. However, the DLQI mean score change (3.5) did not reach the minimal clinically important difference (MCID) of 4 points.<sup>27</sup>

High-need patients with psoriasis sent clinical images, together with some relevant clinical information, via mobile phones every 12 weeks to dermatologists, who then gave treatment instructions. The DLQI scores greatly decreased over the 12-week period, indicating better patient QoL at the end of the study. At Week 0, the median DLQI score was 15.5 (range 4–28), indicating that their psoriasis had a 'very large effect on their life': at Week 6, the median score was 8.5 (range: 0–17), indicating a 'moderate effect' and at Week 12, the median score was 5.0 (range: 0–30) indicating a 'small effect' on their life.<sup>12</sup>



**FIGURE 1** The frequency of use of HRQoL instruments in tele dermatology. CDLQI, Children's Dermatology Life Quality Index; DLQI, Dermatology Life Quality Index; EQ-5D-5L, 5-level EuroQol-5 dimensions; IDQoL, Infants' Dermatitis Quality of Life Index; ISDL, Impact of chronic skin disease on daily life; SF-12, Short Form-12; SF-8, Short Form-8.

In a study of psoriasis, patients assigned to an intervention group received an educational program, attended visits on Weeks 0, 12, 24, 36 and 60, and had access to a study app. Patients in the control group only attended the visits. A significant reduction in the mean DLQI was observed in the control group (from  $8.5 \pm 8.5$  at baseline to  $3.7 \pm 4.1$  at Week 60) and in the intervention group (from  $7.9 \pm 7.6$  to  $4.4 \pm 5.5$ ). There was no significant difference between the patients who used the eHealth smartphone App and those who did not. However, the DLQI mean score change did not reach the MCID of 4 points in the telemedicine group.<sup>13</sup>

Daily text messages, providing reminders and educational tools, were sent for 12 weeks to a group of another 20 patients with psoriasis. A matched control group of 20 patients with psoriasis did not receive the text messages. Both groups had similar scores for Psoriasis Area and Severity Index (PASI), Self-Administered (SA) PASI, Body Surface Area (BSA), Physician Global Assessment (PGA) and DLQI at baseline. However, after 12 weeks the intervention group had significantly ( $p < 0.05$ ) reduced disease severity and improved HRQoL, with lower values of PASI, SAPASI, BSA, PGA and DLQI compared to the control group.<sup>14</sup>

### Comparison of the efficacy of face-to-face consultations and tele dermatology

Patients being referred to a dermatology clinic were randomly assigned to store and forward tele dermatology (digital images and a standardized history) or conventional face-to-face consultations and were followed up for 9 months. Among the 392 patients who met the inclusion criteria and were randomized, 326 completed the allocated

intervention and were included in the analysis. Patients in both randomization groups demonstrated a clinically significant improvement in Skindex-16 scores from baseline, with no significant difference by randomization group, at both 3 and 9 months. Compared with the conventional consultation process, store and forward tele dermatology did not result in a statistically significant difference in HRQoL measured by Skindex-16 at 3 or 9 months after referral.<sup>15</sup>

In a Spanish study of 450 patients randomly assigned to face-to-face or tele dermatology consultations, baseline HRQoL, measured by Skindex-29 and 5-level EuroQol-5 Dimensions index (EQ-5D-5L), was significantly worse in patients in the face-to-face group. After 6 months, HRQoL improvement in both groups was detected but without statistically significant differences between the groups.<sup>6</sup>

In another study of outpatient dermatology patients, over 6 months 50% of participants were treated in an ambulant setting and the other 50% used mainly tele dermatology. In the tele dermatology group between the baseline and the end of the study the DLQI score improved in 20% of the patients, stayed the same in 53% and deteriorated in 27%. In the ambulant setting (comparator) group the DLQI improved in 46%, was unchanged in 7% and deteriorated in 47%.<sup>16</sup>

In a study of melasma in farmworkers, DLQI scores were compared between those with and those without melasma, and between those treated using face-to-face consultations and those using tele dermatology. There was no significant difference in DLQI scores between the groups.<sup>17</sup>

HRQoL was measured in adult and paediatric patients with atopic dermatitis either receiving direct-access online care or receiving care in person. Between baseline and 12 months, the mean within-group reduction in DLQI

**TABLE 1** Brief description and main results of included studies.

References	Brief description of the study	Used HRQoL instruments	Main results related to HRQoL
Lopez-Liria et al., 2022 <sup>6</sup>	A total of 450 patients were randomly assigned to teledermatology or face-to-face dermatology groups.	Skindex-29, EQ-5D-5L	At the end of the study period, the HRQoL of the patients in both groups was significantly higher as compared to their baseline levels.
Marasca et al., 2022 <sup>7</sup>	Psychological video consultations through teledermatology-services for 23 patients during the COVID-19 pandemic.	DLQI	Psychological video consultations led to a significant reduction of the DLQI (from 4.4 ± 3.9 at baseline to 1.6 ± 2.5 at Week 4) in patients suffering from chronic skin conditions during the COVID-19 pandemic.
Damiani et al., 2022 <sup>10</sup>	In this multicentre prospective study 57 patients atopic dermatitis patients with facial manifestation were followed with teledermatology and evaluated by two board-certified dermatologists at the baseline (T0) and after 1 month (T1) in which patients started to wear masks >6h per day.	DLQI	Both DLQI and EASI increase during the time period ( $P < 0.0001$ ). DLQI variation was not influenced by age, BMI, and gender, mask type used and AD therapy ( $p = 0.99$ ), while EASI variation was significantly influenced by BMI, gender, and therapy ( $p = 0.004$ ).
Al Quran et al., 2015 <sup>11</sup>	All consecutive patients with skin diseases attending teledermatology clinics at two rural hospitals in Jordan were included in the study. Patients were interviewed at their initial visit and again after 8 weeks. Ninety teledermatology consultations were performed for 88 patients.	SF-8, DLQI	The mean SF-8 score increased significantly ( $p < 0.005$ ). The mean DLQI score decreased significantly ( $p < 0.005$ ) indicating that there had been an improvement in the patients' QoL since baseline.
Frühauf et al., 2012 <sup>12</sup>	High-needed patients with psoriasis per-formed visits over 12 weeks transmitting clinical images together with some relevant clinical information via mobile phones to teledermatologists, who provided treatment instructions. Ten patients and two teledermatologists completed 20-item patient (Weeks 6 and 12) and 10-item physician (at Week 12) acceptance questionnaires. In addition, patients answered the DLQI at Weeks 0, 6 and 12.	DLQI	The DLQI scores noticeably decreased over the 12-week period, indicating better patient quality of life at the end of the study. At Week 0, patients assigned to their disease a very large effect on their life with a median score of 15.5 (range 4–28); while at Week 6, they perceived a moderate effect with a median score of 8.5 (range: 0–17), and at week 12, they noticed only a small effect, with a median score of 5.0 (range: 0–30).
Domogalla et al., 2021 <sup>13</sup>	Patients with psoriasis in the intervention group received an educational program; attended visits on Weeks 0, 12, 24, 36 and 60; and had access to the study app. Patients in the control group only attended the visits.	DLQI	A significant reduction in the DLQI was observed at Weeks 24 and 60. There was no significant difference between psoriatic patients who used eHealth smartphone App and those who did not use it.
Balato et al., 2013 <sup>14</sup>	Daily text messages, providing reminders and educational tools, were sent for 12 weeks to a group of 20 patients with psoriasis. A matched control group of 20 patients with psoriasis was used for comparison of the same outcomes. Both patient groups had similar scores for PASI, SAPASI, BSA, PGA and DLQI at baseline.	DLQI	After 12 weeks the intervention group reported a significantly better improvement of disease severity as well as QoL, showing lower values of PASI, SAPASI, BSA, PGA and DLQI with respect to the control group ( $p < 0.05$ ).
Whited et al., 2013 <sup>15</sup>	Patients being referred to a dermatology clinic were randomly assigned, stratified by site, to teledermatology or the conventional consultation process. Among the 392 patients who met the inclusion criteria and were randomized, 326 completed the allocated intervention and were included in the analysis. Store and forward teledermatology (digital images and a standardized history) or conventional text-based consultation processes were used to manage the dermatology consultations. Patients were followed up for 9 months.	Skindex-16	Patients in both randomization groups demonstrated a clinically significant improvement in Skindex-16 scores between baseline and 9 months with no significant difference by randomization group ( $p = 0.66$ , composite score). No significant difference in Skindex-16 scores by randomization group between baseline and 3 months was found ( $p = 0.39$ , composite score). Compared with the conventional consultation process, store and forward teledermatology did not result in a statistically significant difference in skin-related quality of life at 3 or 9 months after referral.
Eber et al., 2019 <sup>16</sup>	Over a period of approximately 6 months, 50% of the patients were treated in an ambulant setting, the other 50% used mainly teledermatology. In all, 40 patients—20 in the tele-group and 20 in the control group were included in the study.	DLQI	In the telegroup, the DLQI score showed an improvement in quality of life in 20% of the patients between baseline and end of the study, 53% showed no change and 27% showed a deterioration. In the control group, there was an improvement in 46%, 7% felt their situation was unchanged and 47% felt their quality of life was worse than at the start of the study.
Pichardo et al., 2009 <sup>17</sup>	The prevalence of melasma was assessed in three studies of Latino men; by direct examination in a study of 25 Latino poultry workers, by direct examination in a study of 54 Latino farmworkers and by examination of store-and-forward teledermatology images in a study of 300 Latino farmworkers.	DLQI	The difference between DLQI scores for those with and without melasma was not significant in either of the farmworker studies (face to face consultation and teledermatology).



TABLE 1 (Continued)

References	Brief description of the study	Used HRQoL instruments	Main results related to HRQoL
Kornmehl et al., 2017 <sup>18</sup>	In this study 156 patients were randomized to receiving care through a direct-access online platform or in person. Patients were seen for six visits over 12 months.	DLQI, CDLQI, SF-12	Between baseline and 12 months, the mean within-group difference in DLQI score in the online group was $4.1 \pm 2.3$ ; for the in-person group, the within-group difference was $4.8 \pm 2.7$ . The mean within-group difference in CDLQI score in the online group was $4.7 \pm 2.8$ ; for the in-person group, the within-group difference was $4.9 \pm 3.1$ . The mean within-group difference in physical component score (PCS) and mental component score (MCS) SF-12 scores in the online group was $6.5 \pm 3.8$ and $8.6 \pm 4.3$ ; for the in-person group, it was $6.8 \pm 3.2$ and $9.1 \pm 3.8$ , respectively. The difference in the change in DLQI, CDLQI, SF-12 PCS and SF-12 MCS scores between the two groups was $0.72$ (95% confidence interval [90% CI], $-0.97$ to $2.41$ ), $0.23$ (90% CI, $-2.21$ to $2.67$ ), $0.34$ (90% CI, $-1.16$ to $1.84$ ) and $0.51$ (90% CI, $-1.11$ to $2.13$ ), respectively. All differences were contained within their equivalence margins. Adult and paediatric AD patients receiving direct-access online care had equivalent quality of life outcomes as those seen in person.
Young et al., 2023 <sup>19</sup>	This 12-month randomized controlled equivalency trial randomly assigned patients with psoriasis 1:1 to receive online or in-person care. Functional impairment and depression were assessed at baseline and at 3-month intervals using the 5-level EuroQoL-5 Dimensions index and Patient Health Questionnaire-9. Overall, 296 patients were randomly assigned to the online or in-person groups.	EQ-5D-5L	The online health model was equivalent to in-person care for reducing functional impairment and depressive symptoms in patients with psoriasis.
Chambers et al., 2012 <sup>20</sup>	A total of 64 participants with psoriasis were randomized to receive follow-up care either in-office or online over a 24-week period. Patients randomized to the online group underwent standardized training on capturing high-quality digital images of their psoriatic skin and transmitting these images and clinical history to a dermatologist securely. The dermatologist then performed asynchronous, online evaluation and provided recommendations directly to patients.	DLQI	The DLQI scores improved during the study period. No significant differences existed between the two groups.
Armstrong et al., 2019 <sup>21</sup>	Psoriatic patients were randomly assigned to either online ( $n = 148$ ) or in-person interventions ( $n = 148$ ), stratified by site and disease severity. Authors examined the differences in the change in quality of life between the two arms, as measured by Skindex-16 and DLQI over 12 months.	DLQI, Skindex-16	The total Skindex-16 scores declined from the baseline in both groups over 12 months, showing improvement in QoL. In the online group, the unadjusted mean decline in the total Skindex-16 score from baseline across follow-up visits was $9.02 \pm 20.67$ . In the in-person group, the mean decline from baseline across follow-up visits was $10.55 \pm 23.50$ . The DLQI scores declined from the baseline in both groups. In the online group, the unadjusted mean decline from baseline across follow-up visits was $1.64 \pm 4.34$ . In the in-person group, the mean decline from baseline across follow-up visits was $1.18 \pm 4.77$ .
Oostveen et al., 2014 <sup>22</sup>	Short-contact dithranol cream was started if treatment with topical corticosteroids with or without calcipotriene failed, or if patients had moderate-to-severe psoriasis [Psoriasis Area and Severity Index (PASI) score around 10 and/or a Children's Dermatology Life Quality Index (CDLQI) score around 10. Patients were given the possibility to choose between regular day care or day care with telemedicine, primarily to reduce the burden of travelling for patients living far away. QoL was scored with a validated Dutch version of the CDLQI. In the first week all patients were seen for 4 days at the day care centre; thereafter visits were scheduled two times per week. From the 2 week, the telemedicine group replaced one visit per week by a scheduled video call. Between the visits, patients treated themselves daily at home. The PASI, CDLQI and demographic characteristics did not differ significantly between the two groups, except for a preponderance of boys (82%) in the telemedicine group.	CDLQI	Significant mean change in CDLQI score of $-5.1$ was found $-4.1$ for regular day care versus $-6.1$ for telemedicine, ( $p = 0.25$ ). Baseline: regular day care $8.6 \pm 3.9$ , day care with telemedicine $10.8 \pm 6.6$

(Continues)

TABLE 1 (Continued)

References	Brief description of the study	Used HRQoL instruments	Main results related to HRQoL
van Oss-Medendorp et al., 2012 <sup>23</sup>	A randomized controlled cost-effectiveness study from a societal perspective in adults and parents of children with moderate atopic dermatitis. Outcomes were QoL, severity of atopic dermatitis, itching and direct and indirect costs. In total, 199 patients were included.	DLQI, IDQoL, two parts of the ISDL	There were no significant differences between both groups over time for QoL ( $p$ for interaction = 0.45)
Roca et al., 2022 <sup>24</sup>	Validation of a virtual assistant to improve the QoL of psoriatic patients. In total, 30 patients diagnosed with moderate-severe psoriasis were included in the study.	DLQI	DLQI at the 1st assessment $4.4 \pm 4.9$ DLQI at the last assessment $2.8 \pm 5.1$ , $p = 0.04$
Stadler et al., 2021 <sup>25</sup>	The purpose of this survey was to investigate the satisfaction of patients who had received dermatological advice via telephone during the COVID-19 pandemic and to analyse their general opinion about eHealth as well as possible limitations for a broad implementation. Ninety-one patients managed in the dermatology department using telephone consultation during the COVID-19 pandemic were interviewed.	DLQI	Higher disease burden (DLQI) was associated with lower satisfaction ( $p = 0.04$ ).
Williams et al., 2001 <sup>26</sup>	The aim of the study was to assess the association between perceived skin-related quality of life and patient satisfaction with a nurse-led teledermatology service. In a mobile nurse-led teledermatology clinic located in four inner city general practices in Manchester, the teledermatology service used digital cameras to capture and store images of skin conditions for remote diagnosis by dermatologists. One hundred and twenty-three adult patients, non-urgent dermatology referrals from primary care, completed the DLQI and a 15-item patient satisfaction questionnaire.	DLQI	Patients reporting lower quality of life as measured by the DLQI were more likely to prefer a face-to-face encounter with a dermatologist ( $r = 0.216$ , $p < 0.05$ ), and to evince anxiety about being photographed ( $r = 0.223$ , $p < 0.05$ ).

score in the online group was  $4.1 \pm 2.3$ ; for the in-person group, the within-group reduction was  $4.8 \pm 2.7$ . The reduction in DLQI scores was greater than the MCID in both groups. The mean within-group difference in Children's Dermatology Life Quality Index (CDLQI) score in the online group was  $4.7 \pm 2.8$  and for the in-person group, the difference was  $4.9 \pm 3.1$ . The mean within-group difference in physical component score (PCS) and mental component score (MCS) SF-12 scores in the online group was  $6.5 \pm 3.8$  and  $8.6 \pm 4.3$ ; and for the in-person group the mean differences were  $6.8 \pm 3.2$  and  $9.1 \pm 3.8$ , respectively. The difference in the change in DLQI, CDLQI, SF-12 PCS and SF-12 MCS scores between the two groups was 0.72 (95% confidence interval [90% CI],  $-0.97$  to 2.41), 0.23 (90% CI,  $-2.21$  to 2.67), 0.34 (90% CI,  $-1.16$  to 1.84) and 0.51 (90% CI,  $-1.11$  to 2.13), respectively. Adult and paediatric AD patients receiving direct-access online care had equivalent QoL outcomes to those seen in person.<sup>18</sup>

In a randomized controlled equivalency trial patients with psoriasis were randomly assigned to receive online or in-person care. Functional impairment and depression were assessed at baseline and at 3-month intervals using the EQ-5D-5L and Patient Health Questionnaire-9. The online care model was equivalent to in-person care in reducing functional impairment and depressive symptoms in patients with psoriasis.<sup>19</sup>

In a study by Chambers et al.<sup>20</sup> 64 participants with psoriasis were randomized to receive follow up care either in-office or online over a 24-week period. Patients randomized to the online group underwent standardized training on capturing high-quality digital images of their psoriatic skin and transmitting these images and clinical history to a dermatologist securely. The dermatologist then performed asynchronous, online evaluation and provided recommendations directly to patients. DLQI scores improved during the study period in both groups, with no significant difference in scores between the two groups.

In a study by Armstrong et al.<sup>21</sup> psoriatic patients were randomly assigned to either online ( $n = 148$ ) or in-person interventions ( $n = 148$ ), stratified by site and disease severity. The total DLQI and Skindex-16 scores gradually became less in both groups over 12 months. In the online group, the unadjusted mean decline in the total Skindex-16 score from baseline across follow up visits was  $9.02 \pm 20.67$ . In the in-person group, the mean decline from baseline across follow up visits was  $10.55 \pm 23.50$ . The DLQI scores declined from the baseline in both groups, showing improvement in QoL. In the online group, the unadjusted mean decline from baseline across follow up visits was  $1.64 \pm 4.34$ . In the in-person group, the mean decline from baseline across follow up visits was  $1.18 \pm 4.77$ . These mean score changes do not reach the MCID for the DLQI of 4 points.

In a study of children with psoriasis, short-contact dithranol cream was started if topical corticosteroids with or without calcipotriene had failed, or if patients had moderate-to-severe psoriasis (PASI score around 10 and/or a CDLQI score around 10). Patients were allowed to choose between regular day care or day care with telemedicine. The CDLQI was used

to measure HRQoL. In the first week all patients were seen for 4 days at the day care centre; thereafter visits were scheduled two times per week. From the 2 week, the telemedicine group replaced one visit per week by a scheduled video call. Between the visits, patients treated themselves daily at home. The PASI, CDLQI and demographic characteristics did not differ significantly between the two groups. A significant mean change in CDLQI score of  $-5.1$  was found ( $-4.1$  for regular day care vs.  $-6.1$  for telemedicine,  $p=0.25$ ).<sup>22</sup>

A randomized controlled cost-effectiveness study showed that monitoring remotely ('E-health') for follow up of patients with atopic dermatitis is as effective as standard face-to-face care with regard to QoL and severity of disease.<sup>23</sup>

We are not aware of any data specifically concerning whether the DLQI can be scored remotely in an equivalent way to that when completed on paper. However 104 subjects with skin disease were asked to complete the DLQI both via an app on an iPad and on paper, with a standard time between completion.<sup>28</sup> As the scores were equivalent, this study suggests that completing the DLQI (and indeed other QoL measures) remotely is likely to result in similar scores as that from paper completion.

## Tele dermatology and AI

A 'virtual assistant', that connects patients with healthcare professionals through online medical consultations, was assessed to determine whether use of this could improve patients' HRQoL. The 'Virtual assistant' used was a chatbox function to enhance communication between patient and dermatologist. Its use in psoriatic patients led to improvement in the mean DLQI score ( $4.4 \pm 4.9$  at baseline and  $2.8 \pm 5.1$  at the end of the study,  $p=0.04$ ).<sup>24</sup> However as there was no comparator or control group these figures are difficult to interpret.

## Satisfaction with tele dermatology

A survey investigated the level of satisfaction of patients who had received dermatological advice via telephone during the COVID-19 pandemic. Patients with higher disease burden, as measured by the DLQI, experienced lower satisfaction with the telephone consultations ( $p=0.042$ ). Most patients preferred traditional face-to-face medical consultations to telephone consultations.<sup>25</sup>

Patients reporting high impairment of their HRQoL, as measured by the DLQI, were more likely to prefer a face-to-face encounter with a dermatologist than patients experiencing low impairment of their QoL.<sup>26</sup>

## Tele dermatology and psychological help

Psychological video consultations led to a significant HRQoL improvement measured by the DLQI (from  $4.4 \pm 3.9$  at baseline to  $1.6 \pm 2.5$  at Week 4) in 23 patients suffering from

chronic skin conditions during the COVID-19. However this study had no comparison group.<sup>7</sup>

## Tele dermatology, HRQoL and COVID-19 pandemic

A multicentre prospective study of atopic dermatitis patients with facial involvement who had started to wear masks  $>6$  h per day because of the COVID-19 pandemic was organized. Patients were evaluated by two board-certified dermatologists at baseline and after 1 month using tele dermatology consultations. Both DLQI and Eczema Area and Severity Index (EASI) scores increased during the time period ( $p < 0.0001$ ). Changes in DLQI were not influenced by age, body mass index (BMI) and gender, mask type used and AD therapy.<sup>10</sup>

## DISCUSSION

The majority of studies identified in this review demonstrate no difference in HRQoL impairment between patients treated face-to-face or treated remotely. This provides some confidence in continuing to use and develop remote methods of routine dermatology care and advice. We are not aware of any studies that have investigated whether there are differences in the approach concerning QoL assessment between clinical and tele dermatology visits. However whether subjects completed the DLQI either using paper and pen, or via an app, the scores remained similar<sup>28</sup>: this provides some reassurance that it is unlikely that there will be major differences from traditional methods if assessment of QoL is via tele dermatology.

A systematic review that studied outcome measurement instruments used in randomized controlled trials of tele dermatology conducted between 2008 and 2018 concluded that the most frequently used instrument was the DLQI.<sup>29</sup> However, at that time only three studies were identified. Our literature review has also confirmed that the DLQI is the most frequently used QoL instrument in tele dermatology and was used in 15 studies. A simple DLQI app is available in seven languages (reference <https://www.cardiff.ac.uk/medicine/resources/quality-of-life-questions/dermatology-life-quality-index>). It has been demonstrated that the DLQI delivered and completed electronically is completed and scored in an equivalent way to the paper version.<sup>30</sup> This raises the prospect of being able to simply gain QoL scores to inform clinical decision taking in remote consultations.

Use of the DLQI app is of course not limited to its possible use in tele dermatology and it may be used during face-to-face consultations. It is important that further apps be developed to facilitate the use of other validated dermatology-specific HRQoL instruments, such as for those used in children with skin diseases (CDLQI<sup>31-33</sup> and InToDermQoL<sup>34-37</sup>) and for disease-specific instruments.



Detailed recommendations on treatment goals and changes of treatment approaches, based on HRQoL questionnaire scores with a validated banding system (as for the DLQI), may be an important and promising approach that can be used not only face-to-face but also to enhance teledermatology consultations.<sup>38</sup>

Nearly all patients with immune-mediated inflammatory and allergic skin diseases can be vaccinated with the registered COVID-19 vaccines<sup>39,40</sup> and current data seem to confirm the safety and efficacy of COVID-19 vaccination in patients undergoing biological treatments.<sup>41,42</sup> During the pandemic it was unclear to what extent teledermatology could effectively fulfil the different needs of those patients with skin disease who were on biological treatments and who needed to avoid face-to-face consultations. Patients on biological treatments usually have severe quimp and such patients, with more impaired HRQoL, prefer face-to-face consultations.<sup>25,26</sup> Itch and pain have many consequences for patients with skin disease,<sup>43</sup> also resulting in more impaired HRQoL that in turn may lead to a high preference for face-to-face consultations.

Educational information, virtual assistance and psychological help by means of telemedicine technologies may not be a substitute for regular face-to-face consultations but rather serve as beneficial additions: HRQoL assessment may be a valuable part of these technologies. In another review it was shown that telemedicine is as effective as traditional face-to-face care in terms of improvement of patient QoL and reduction of disease severity, but with the advantage of substantial cost-saving.<sup>44</sup>

The principles of HRQoL instrument selection for their use in in teledermatology are similar to those recommendations previously published by the EADV TF on QoL and patient-oriented outcomes.<sup>45-61</sup>

## Recommendations for future studies

Randomized controlled studies comparing HRQoL changes following face-to-face and teledermatology consultations in different skin diseases. Development of apps for HRQoL assessment in different skin diseases and among different age groups of dermatologic patients. Studies to identify dermatologic patients who may need psychological help and studies to measure the efficacy of this help. International studies to compare the influence of teledermatology consultations on patients' quimp.

## Position statements

- Teledermatology encompasses several different activities and HRQoL assessment may be an important integral part of several of them.
- HRQoL assessment may be easily and accurately performed during teledermatology consultations. It is

especially important to monitor HRQoL of patients with chronic skin diseases during lockdowns or in situations where it is difficult to reach a hospital for face-to-face consultation.

- Regular assessment of HRQoL of patients with skin diseases during teledermatology consultations may help to monitor the effectiveness of this type of care delivery and may help to highlight the needs of individual patient.
- We recommend the use of the DLQI in teledermatology, including the use of the DLQI app which is available in seven languages.
- It is important that apps are developed to facilitate the use both of dermatology-specific HRQoL instruments for use in children (for example the CDLQI and InToDermQoL) and of disease-specific instruments.

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## CONFLICT OF INTEREST STATEMENT

AYF is joint copyright owner of the DLQI. Cardiff University receives royalties and AYF receives a share of these under standard university policy. AB had royalties for publications: Practical Psychodermatology Wiley 2014; consulting fees from Almirall, Abbvie, Galderma, Lilly, Leo, Janssen, Novartis, UCB, Sanofi, Pfizer. JCS received honoraria from AbbVie, LEO Pharma, Novartis,

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## DATA AVAILABILITY STATEMENT

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

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