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Electronic Patient-Reported Outcomes in Hidradenitis Suppurativa: Content Validity and Usability of the Electronic Hidradenitis Suppurativa Symptom Daily Diary, Hidradenitis Suppurativa Symptom Questionnaire and Hidradenitis Suppurativa Quality of Life Questionnaire

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KEY MESSAGE

The electronic HSSDD, HSSQ, and HiSQOL© are valid, acceptable, and usable instruments for assessing HS.

ABSTRACT

Background: Hidradenitis suppurativa (HS), a chronic skin condition that causes pain and physical dysfunction, can impact significantly on quality of life. Disease-specific tools have been designed to assess the patient impact of HS, including the HS Symptom Daily Diary (HSSDD), the HS Symptom Questionnaire (HSSQ) and the HS Quality of Life (HiSQOL©) questionnaire, which have been developed into electronic instruments (eHSSDD, eHSSQ and eHiSQOL©).

Objectives: To establish the content validity of the electronic version of the HSSDD and HSSQ, and the acceptability and usability of the HSSDD, HSSQ and HiSQOL© using concept elicitation and cognitive debriefing interviews.

Methods: This was a non-interventional qualitative video interview study involving participants aged ≥18 years with moderate to severe HS recruited from a single clinical site in the USA. Interviews gathered feedback on participants' symptom experience, followed by training and completion of the eHSSDD, eHSSQ, and eHiSQOL© questionnaires on electronic hand-held devices. Participants were then interviewed on the content of the eHSSDD and eHSSQ, and the acceptability and usability of all three instruments. Interviews were transcribed and qualitatively analysed.

Results: Twenty participants with moderate to severe HS (median age: 41.5 [range: 20.0–64.0]; n=16/20 female) were included. All participants found the eHSSDD, eHSSQ and eHiSQOL© instructions clear, and described the instruments as 'easy', 'simple' and 'self-explanatory'. Overall understanding of individual items within the eHSSDD and eHSSQ was high; however, 6/20 participants had difficulty in understanding the 'average skin pain' item in the eHSSDD. All participants were able to accurately recall their symptoms within the recall periods of the eHSSDD and eHSSQ, although 4/20 participants found the 24-hour recall period of the eHSSDD limiting. Completion time was quick across all instruments and usability was high, with the majority of participants reporting no difficulty in completing questionnaires on electronic devices.

Conclusion: The concepts covered in the eHSSDD and eHSSQ are relevant and important to patients, supporting their content validity. The findings also provide evidence of acceptability and usability of the eHSSDD, eHSSQ, and eHiSQOL©. A limitation was that all participants were recruited from a single site, which may have introduced selection bias and thus limit the generalisability of results.

INTRODUCTION

Hidradenitis suppurativa (HS) is a chronic, relapsing, inflammatory skin condition characterised by painful nodules, abscesses, skin tunnels (sinus tracts/fistulae) and scarring [1, 2]. The chronic pain associated with HS is a major contributor to reduced quality of life (QoL) in patients, and symptoms such as malodorous discharge result in embarrassment and disabling social stigma [1]. HS can therefore lead to low self-worth and negatively affect patients socially, professionally and psychologically, decreasing their overall QoL [1, 2]. Furthermore, the symptom burden of HS can cause greater impairment of patient QoL compared with other dermatological conditions [2].

Patient reported outcome (PRO) instruments assessing patient experience, symptoms, disease severity and QoL are crucial to evaluate the efficacy of HS treatments in clinical trials. They capture unique information about the impact of HS from the patient perspective, which may not be captured using clinician-reported endpoints [3]. The Dermatology Life Quality Index (DLQI) is a dermatology-specific health-related QoL (HRQoL) questionnaire that was first published in 1994 and is now the most commonly used tool to assess dermatology-related QoL in clinical trials [4-6]. However, the DLQI is a pan-dermatology tool that may not capture all aspects of QoL that are affected in HS [7]. For example, HS-specific items, such as drainage and odour, are not captured in general dermatological PRO instruments, yet these signs and symptoms can have a detrimental effect on HS patients' quality of life [2, 8]. Therefore, a number of disease-specific tools have been designed to address specific aspects of HS and assess the impact of HS on patients' lives, including the Hidradenitis Suppurativa Quality of Life (HiSQOL©) questionnaire [7, 9, 10]. These instruments capture the key signs and symptoms of HS, as well as the impact of HS as perceived by patients, resulting in them being more reflective of patients' experiences compared with non-disease-specific tools [11]. The HiSQOL© has been developed with patients and experts of the HIdradenitis SuppuraTiva cORe outcomes set International Collaboration (HISTORIC), based on literature review and qualitative interviews (combined concept elicitation and cognitive interviews) to capture patients' HS-specific HRQoL [7, 10]. Two other HS-specific PRO instruments, the Hidradenitis Suppurativa Symptom Daily Diary (HSSDD) and the Hidradenitis Suppurativa Symptom Questionnaire (HSSQ), were developed ahead of a phase 3 clinical development programme for bimekizumab to assess core patient-reported signs and symptoms of HS [12-14]. The HSSDD is a daily diary with a 24-hour recall period that contains five items assessing the severity of key patient-reported signs or symptoms using an 11-point numerical rating scale (NRS). Similarly, the HSSQ is a questionnaire intended to be completed less frequently that contains four items assessing core patient-reported signs/symptoms of HS, and has a longer 7-day recall period.

The US Food and Drug Administration (FDA) review and evaluate PRO instruments used to demonstrate a treatment benefit in clinical trials. Their guidelines aim to ensure the instruments used are well-defined, reliable and fit-for-purpose to support labelling claims [15]. Therefore, the content validity of new instruments needs to be assessed and documented in line with regulatory requirements and electronic Clinical Outcome Assessment (eCOA) guidelines to ensure that the instruments are adequately developed and capture all concepts relevant to patients in their context of use. In addition, it needs to be established that all instrument components are complete and understandable to the patient [16-18]. The paper version of the HiSQOL© questionnaire has demonstrated reliability, validity and responsiveness in assessing HS-specific HRQoL among US and Danish HS populations [10, 19], and has been adapted to be used as electronic version (eHiSQOL© questionnaire). The HSSDD and HSSQ are new HS-specific instruments that have been developed as electronic versions (eHSSDD and eHSSQ). Therefore, these electronic versions (the eHSSDD, the eHSSQ, and the eHiSQOL© questionnaire) must be assessed in line with FDA and eCOA guidelines on instrument modification to ensure acceptability and usability [20, 17, 18].

Objectives

The objectives of this study were to establish the content validity of the electronic PRO instruments eHSSDD and eHSSQ, and the acceptability and usability of the eHSSDD, the eHSSQ, and the eHiSQOL© questionnaire using concept elicitation and cognitive debriefing interviews among participants with moderate to severe HS.

METHODS

Study design and procedures

This was a non-interventional qualitative interview study with 20 adult participants (≥18 years of age) in the USA with moderate to severe HS. Moderate to severe HS was defined as a total of ≥5 inflammatory lesions (abscess and/or inflammatory nodules) present in at least two distinct anatomic areas (e.g., left and right axilla), one of which must be at least Hurley Stage 2 at screening (where Stages 1, 2 and 3 represent mild, moderate and severe abscess/nodule formation, respectively) [1]. This was based on clinical records and clinical judgment by the site principal investigator.

Participants were recruited from the Penn State Hershey Medical Centre (Hershey, Pennsylvania, USA) directly through the clinical site's databases and/or medical records. Exclusion criteria included previous participation in a bimekizumab trial, a draining tunnel count of >20, experience with reviewing or completing any version of the HiSQOL© in the past six months and any other medical condition that may interfere with the ability to take part in the video interview. Inclusion and exclusion criteria are further described in **Supplementary Table 1**.

One-on-one semi-structured interviews were conducted using the web-based video teleconference platform Zoom™. Prior to the interview, participants were introduced to the study, screened for eligibility, and were asked for verbal consent over the phone. In addition, participants were sent an electronic handheld device and tablet (to complete the electronic questionnaires on) as well as other information including screenshots of the eHSSDD, eHSSQ and eHiSQOL© questionnaires, sociodemographic and device familiarity forms, and a summary explanation of research. Interviewers were trained on system functions, setup and any potential issues that may arise while participants use the devices. Training was via the eCOA vendor Clario (formerly known as eResearch Technology).

The interview was conducted according to a script. It began with an introduction to the study, collecting information on participants' HS symptom experience (concept elicitation) and training on the use of the electronic devices for the questionnaires and functionality for use (via a training module on each device prior to completing the questionnaires). This was followed by completion of the eHSSDD on an electronic hand-held device, and the eHSSQ and eHiSQOL© questionnaire on a tablet. The participants' comprehension of the features of the eHSSDD and eHSSQ were then evaluated. This included comprehension of the instructions, items, response options and recall period (cognitive debriefing); as well as the acceptability and usability of the electronic versions of the three electronic PRO instruments on a handheld device (Bluebird™ SF550) and/or tablet (Samsung™ Tab A).

After the first five interviews, the interview script was streamlined to minimise redundancy. At the end of each interview, participants were asked to complete the sociodemographic form and the device familiarity form delivered to them prior to the interview. The video interviews lasted approximately 90 minutes each, were conducted in US English, audio-recorded and subsequently transcribed. Participant-identifying information was removed before coding and analysis.

Electronic instruments

The HSSDD was developed based on a literature review and expert input. It includes five items that assess severity of core HS symptoms (itch, average skin pain, worst skin pain, smell/odour and drainage/oozing) over the past 24 hours. Items are assessed on an 11-point NRS, ranging from 0 (no symptoms) to 10 (skin pain/itch/smell/odour as bad as you can imagine; a lot of drainage or oozing). During the interview, the eHSSDD was administered on a handheld device. The device was smaller than a tablet and a similar size to a mobile phone. Screenshots of the eHSSDD are provided in **Figure 1**. A tabular version of this questionnaire and the applicable response options are shown in **Supplementary Table 2**.

The HSSQ was developed through a literature review and expert input. It includes four items that assess the severity of core HS symptoms (skin pain, itch, smell/odour and drainage/oozing) over the past seven days on an 11-point NRS, ranging from 0 (no symptoms) to 10 (skin pain/itch/smell/odour as bad as you can imagine; a lot of drainage or oozing). A tablet was used to administer this questionnaire during the interview. Screenshots of the eHSSQ are provided in **Figure 2**. A tabular version of this questionnaire and the applicable response options are shown in **Supplementary Table 3**.

The HiSQOL© questionnaire includes 17 items that are assessed over the past seven days on a Likert-type scale with either five to seven response levels. These items are grouped in three subscales assessing: symptoms (four items), psychosocial impact (five items) and activities and adaptations (eight items), the sub-scale scores range from 0–16, 0–20, and 0–32 respectively [10]. All item scores are summed to generate the total score (0–68). The eHiSQOL© questionnaire was administered on a tablet during the interview. Screenshots of the eHiSQOL© questionnaire are provided in **Figure 3**. A tabular version of this questionnaire and the applicable response options are shown in **Supplementary Table 4**.

Data management and analysis

A coding dictionary was developed for qualitative data analysis. The data quality control process included training of the coders on the coding dictionary and a quality check of the coding and coding reconciliation. Following each interview, the interview transcripts were reviewed for content and any participant-identifying information was removed. Qualitative data were coded and thematically analysed using ATLAS.ti version 9.0 software. Key concepts

were identified by interviewers and translated into codes to summarise the results. Quotes from participants were grouped and summarised by thematic code.

Quantitative data from Case Report Forms (i.e., sociodemographic form, clinical form, device familiarity form) were transferred directly into a secured DataFax database, providing an FDA compliant, time-stamped electronic audit trail of the data. Descriptive statistics were generated using SAS® 9.4 software. No data imputation was performed; unanswered questions were coded as missing**.**

RESULTS

Participant demographics and baseline characteristics

The median age of participants was 41.5 (range: 20.0–64.0) years old, and 16/20 were female. Black/African American participants represented the second most common racial group across the sample (n=6/20). Most (n=16/20) participants attended college or had higher level education. Furthermore, 3/20 participants reported being unemployed due to their HS condition.

The median duration since HS diagnosis was 6.0 (range: 0.5–41.3) years and 15/20 participants had moderate disease based on Hurley Stage; the remaining 5/20 participants had Hurley Stage 3. Participants most commonly self-rated their HS as moderate (n=9/20) because they were symptomatic with active HS widespread across the body, or experienced flare ups. Six participants self-reported their HS as severe, and 5/20 participants self-reported their HS as mild. Past and current therapies used by participants to manage HS included antibiotics, antiandrogenic medication, immunosuppressive drugs, and minor surgeries or other procedures. Patient characteristics are further described in **Supplementary Table 5**.

Patient-reported signs and symptoms of HS

The most common patient-reported signs and symptoms of HS were drainage/oozing (n=20/20), followed by skin pain and itching (both n=19/20) and smell/odour (n=18/20) (**Figure 4A**). Thirteen participants reported that skin pain was the symptom that led them to seek a doctor's advice. Drainage/oozing and smell/odour were reported by 11/20 participants and 4/20 participants respectively, as the symptom that led them to consult a doctor. Pain, itching, smell/odour and drainage/oozing most commonly appeared in the axilla region (pain: n=10/20, itching: n=5/20, drainage/oozing: n=12/20, odour/smell: n= 8/20) and inguinal region (pain: n=10/20, itching: n=8/20, drainage/oozing: n=9/20, odour/smell: n=7/20; **Supplementary Figure 1**). Fifteen participants reported at least one other symptom such as boils, bleeding, cysts, swelling or tunnelling. Participants most commonly described their HS as 'painful', 'irritating' and 'uncomfortable' (n=8/20). It was also characterised as a disease that was 'never-ending', 'non-stop', 'relentless', and doesn't go away' (n=6/20) (**Figure 4B**).

The majority of participants had used electronic devices in their daily lives, prior to the study; 11/20 participants reported using a tablet/iPad© and 18/20 participants reported using a smart phone. Three participants noted that they used other touch screen devices, such as an Android™ or a laptop, and only one participant reported not using such devices. Many participants noted they were 'very' or 'extremely' familiar with touch screen devices (n=15/20) and were 'very' or 'extremely' confident using these devices (n=14/20). Only one participant reported difficulty reading or using electronic devices in general due to headaches.

Completion and assessment of electronic PRO instruments

eHSSDD

The median scores for the eHSSDD symptom items ranged from 3.0 (range: 0.0–10.0) for smell or odour item to 6.0 (range: 0.0–10.0) for worst itch item (**Table 1**).

Half (n=10/20) of participants spontaneously reported that they found the eHSSDD 'easy/simple' and 'relevant to HS', and 2/20 participants thought it was useful for tracking HS-related information. Half (n=10/20) the participants spontaneously described the questions as 'right' or 'spot on' for HS, and the majority of participants (n=18/20) were able to consistently adhere to the 24-hour recall period. All (n=20/20) participants felt that they were able to accurately recall their HS experience during the 24-hour recall period. However, 4/20 participants found the 24-hour recall period of the questionnaire limiting, since HS can vary based on flare-up frequency.

All (n=20/20) participants expressed that the eHSSDD instructions were clear by restating them in their own words, including but not limited to reflecting on HS-related symptoms, thinking about the past 24 hours, selecting only one answer, and completing the questionnaire at the end of the day. Across all items, most participants (n=19/20) were able to differentiate between the 0–10 numerical response options to select their answer. Only one participant reported some difficulty differentiating response options for the average skin pain item.

Once participants had completed the questionnaire, they were asked to describe the meaning of each item in their own words. All but one (n=19/20) participant correctly interpreted the worst skin pain item. The one participant who did not understand the worst skin pain item suggested it was asking about change in pain severity, rather than an assessment of pain severity within a specific time period. In addition, 2/20 participants discussed other HS symptoms (such as drainage/oozing and smell/odour) when describing the worst skin pain item meaning or providing a rationale for their answer. Furthermore, the majority of participants (n=14/20) generally understood the average skin pain item when describing its meaning; however, 6/20 participants had difficulty describing this concept or articulating the difference between the worst skin pain and average skin pain items. Most participants (n=19/20) correctly interpreted the worst itch item, and the one participant who did not understand was unable to provide a clear response in her own words. Participants generally explained the worst itch item based on the intensity of itch and certain triggers. All (n=20/20) participants were able to correctly interpret the smell/odour and drainage/oozing items. Overall, there was a high understanding of the items among participants.

All (n=20/20) participants thought the handheld device was easy to use when completing the eHSSDD. Most participants (n=13/20) mentioned that the eHSSDD was 'fine', 'easy', 'clear' or 'self-explanatory' with a 'nice set-up'. Four participants also noted that they thought the eHSSDD would be a potentially helpful tool for logging and tracking HS-related information for everyday use, measuring trends and sharing with medical professionals.

The median time to complete the eHSSDD, after training, was 1 minute 12 seconds (minimum: 30 seconds, maximum: 3 minutes 42 seconds). All but one participant (n=19/20) found the training helpful. All (n=20/20) participants correctly interpreted the instructions; none reported difficulty navigating between screens, viewing questions or selecting answers. Only one participant noted that she required additional time to adjust to the handheld device as she typically used an iPhone™ rather than an Android smartphone. Although participants were not specifically asked for their preferences, 3/20 participants provided additional, spontaneous feedback that the handheld device questionnaire was preferred and more convenient to paper, and easier to navigate and select answers.

eHSSQ

The median scores for eHSSQ items ranged between 3.0 (range: 0.0–9.0) for the smell or odour item and 6.0 (range: 0.0–10.0) for the skin pain item (**Table 1**).

When asked about their overall impressions of the eHSSQ, 9/20 participants described it as very useful and self-explanatory, and 7/20 participants described it as easy to read and understand as it was not too long. These participant responses were not mutually exclusive, as in this case, the participants provided spontaneous feedback and were not specifically probed on their responses.

All (n=20/20) participants considered the recall period of seven days relevant, and 2/20 participants noted that this was more accurate than a 24-hour recall period 'as a lot can happen with HS'. All (n=20/20) participants shared that the HSSQ instructions were clear by restating them in their own words, including but not limited to reflecting on HS-related symptoms, thinking about the past seven days, and selecting only one answer. All (n=20/20) participants asked were able to differentiate between the 0 and 10 numerical response options to select their answer (two participants were not asked this question due to interviewer oversight, time restrictions or interviewee fatigue and these data were considered missing for this questionnaire). One participant (n=1/18) did not like the NRS as she felt it could be subjective.

Once participants had completed the questionnaire, they were asked to describe the meaning of each item in their own words. All (n=20/20) participants understood the meaning of each of the four items of the eHSSQ (skin pain, itch, smell or odour, drainage or oozing). When asked what scores participants had chosen for the skin pain item and why, 6/20 participants reported that they chose a number between 0–4 for skin pain as they had little pain, 8/20 chose a number between 5–7 because they had pain they could tolerate, and 6/20 chose a number between 8–10 because they had excruciating pain. In terms of itch, half of participants (n=10/20) rated itch between 0–5 because it was not bothersome or distracting, and the other half selected 6 or above because there was a constant urge to scratch/itch once it began. For the smell or odour item participants that did not experience any smell or odour in the last 7 days (n=6/20) scored 0 for this item; however, 4/20 participants experienced a bad smell every day (scores >0).

Participants provided logical answers for the drainage or oozing item, depending on the volume and flow, the need for additional padding or bandages and whether drainage dripped down the leg or dried after swabbing.

Eight participants liked completing the eHSSQ on the tablet and described it as 'good', 'fine' or 'nice', and 4/20 participants preferred using the tablet for completing the eHSSQ, compared to the handheld device which was used

for eHSSDD. Four participants thought each device was similar in terms of usability. However, it is also important to note that three participants reported that the size of the text on the tablet was not large enough (three females aged between 45–58 years who were moderately to extremely familiar with devices); one participant reported that screen appearance was dim (female aged 28 who was moderately familiar with devices); and three participants reported issues with navigating from screen to screen (two females ages 22 and 64 who were very familiar and a little familiar with devices, and one male aged 63 who was a little familiar with devices).

Median completion time after training, was 56 seconds (minimum: 21 seconds, maximum: 4 minutes 5 seconds). Most participants (n=18/20) found the training helpful. All (n=20/20) participants found the eHSSQ instructions clear and 19/20 participants reported no difficulty completing the questionnaire. Half (n=10/20) of participants expressed confusion on the first page of the eHSSQ instructions due to similarities in the wording to an actual question. Recommendations to minimise this confusion were suggested by participants and included adding in descriptive text at the end of the instructions such as 'click next' or including the instructions on the same page as the first eHSSQ item. Only one participant had difficulty selecting answers, and 3/20 participants reported problems navigating between screens.

eHiSQOL© questionnaire

The eHiSQOL© questionnaire data were missing for 4/20 participants due to interviewer oversight. However, usability information for all (n=20/20) participants was captured. Overall, all (n=20/20) participants considered the eHiSQOL© questionnaire easy to use. Half (n=10/20) of participants spontaneously reported that the eHiSQOL© questionnaire was 'simple', 'clear', 'easy' or 'concise'. When questioned, the remaining 10/20 participants reported that they liked the content, diverse questions and applicable response options. All (n=20/20) participants liked the structure and layout of the eHiSQOL© questionnaire.

No participant reported difficulty in understanding how to complete the eHiSQOL© questionnaire and no participant suggested changing the way the questions or response options appeared on the screen. All (n=20/20) participants were happy with the scale, layout and presentation. One participant (female, extremely familiar with devices) felt the text size on this instrument was small. Four participants specifically suggested that the text size should be enlarged. Two participants reported issues moving between screens due to difficulty getting buttons to respond.

The median time for completion was 3 minutes and 8 seconds (minimum: 49 seconds, maximum: 11 minutes 13 seconds). One participant thought the questionnaire was quick to complete. Three participants needed to change their answer but did not report any problems doing so. All (n=20/20) participants saw and understood the final verification screen.

DISCUSSION

This study aimed to evaluate the relevance and comprehension of the eHSSDD and eHSSQ and confirm acceptability and usability of both questionnaires as well as the eHiSQOL© questionnaire. Study results provided evidence that the concepts covered in the eHSSDD and eHSSQ were relevant and valid to participants with HS, supporting the content validity of both instruments. The study also demonstrated that the instructions, recall period, items and response options were largely understood by participants. Participant feedback on the eHiSQOL© questionnaire confirmed acceptability and usability of this instrument.

Participants with HS presented with a range of HS symptoms that were captured well by the questionnaires. The scores for the smell/odour items in both the eHSSDD and the eHSSQ were lower compared to other items. This may be because two participants reported no smell/odour in the initial elicitation interviews so would have scored zero on this item thereby lowering the mean score among participants. This can be expected since smell/odour aspects of HS may not be as present or prevalent consistently over time for all participants as other aspects of HS. All other signs or symptoms were reported by all (n=20/20) or all but one (n=19/20) participant in the elicitation interviews.

Participants were largely able to correctly interpret content across all PRO instruments. The eHSSDD required participants to distinguish between average and worst skin pain which some participants found difficult. This suggests that participants may not accurately record responses for the average skin pain item. To avoid confusion with the worst and average skin pain items in the eHSSDD, it may be helpful to provide training materials or visual tools to help determine their average skin pain (compared to worst). Alternatively, it may warrant consideration of removing the question on average skin pain from the eHSSDD. The eHSSQ only had one pain item, which aligns to other dermatology tools which typically use one item for overall assessment of pain [4]. In addition, while participants felt they were able to accurately recall their experience to the most fitting response, there were some deviations from

the specified recall periods for the questionnaires (e.g., outside the past 24 hours for the eHSSDD). However, this was only reported for a few participants and could be easily resolved with verbal training or instructions.

This study demonstrated that participants were able to follow and understand the instructions for completing the electronic instruments, after training and overviews of functionality. The participants in this study were relatively young, with a median age of 41.5 years, and had a high level of familiarity with electronic devices, which may not be the case for other pathologies where the average age of the patients is older. However, there were some tablet usability concerns related to viewing the response options and scales and navigating between screens. Most participants (n=19/20 eHSSDD; n=18/20 eHSSQ) believed the training module overview to be a helpful component in preparing for the electronic PRO instruments, suggesting this should be incorporated into the administration of these instruments.

Previous studies have also investigated electronic versions of dermatological PROs such as the study to assess the equivalence of the paper DLQI and electronic DLQI application that is administered via iPad™ [5]. This study provided evidence of equivalence between each administration method, and demonstrated that most participants preferred the electronic DLQI over the paper version [5]. In agreement with the current study, assessment of the electronic DLQI application also found that minor changes to font size and layout may be required to improve usability. However, most participants (76%) still preferred the electronic version of the DLQI and found it easier and more comfortable to use compared to the paper version [5]. Therefore, the findings from this study align with those from the electronic DLQI study.

According to PRO best practices, and to minimise participant burden, it is recommended that PRO instruments should not take longer than 15–20 minutes to complete. The median completion times for all three electronic instruments assessed during this study were under 4 minutes per instrument, suggesting these questionnaires are quick and convenient for participants to complete and could be suitable for daily or regular administration. One participant took over 11 minutes to complete the eHiSQOL© questionnaire, whereas all other participants took less than 5 minutes 40 seconds. This outlier participant was over 60 years of age and had little device familiarity, potentially explaining the extended period of time he required.

Results from this study support the use of the eHSSDD, eHSSQ and eHiSQOL© questionnaires as instruments that can provide participants with the opportunity to regularly track, understand and record their HS experiences. In particular, two participants spontaneously stated that it was of their opinion that the eHSSDD would be a helpful tool for logging and tracking HS-related information for everyday use, measuring trends and sharing with medical professionals. The questionnaires could be delivered to participants to be completed ahead of their appointments and at regular time intervals as a way to monitor their symptoms [21]. Compared with paper PRO instruments, electronic PRO instruments provide a cheaper and quicker alternative [22, 23]. Furthermore, as electronic PRO instruments could include requirements for participants to fully complete questions before moving on, they could also improve data quality by reducing missing data [23].

Incorporating the eHSSDD, the eHSSQ and the eHiSQOL© questionnaire in clinical trials could help ensure that changes in HS symptoms and QoL are assessed from a participant perspective. Moreover, when used in routine clinical practice, they could support discussions on the effectiveness of participants' current HS treatments. Although there does remain a balance between collecting information, while avoiding responder burden and ensuring the data collected are useful, these ePRO instruments have the potential to benefit both clinicians and patients with HS and improve patient care.

Limitations

Although only 20 participants were included in this study, this represented a robust sample size for a qualitative study, particularly in the HS disease area, despite some missing data. Only one question was omitted for two participants during the eHSSQ evaluation. Some of the eHiSQOL© questionnaire answers were not captured due to interviewer oversight. However, overall, the missing data from the HiSQOL© scores had little impact on the conclusions regarding overall content validity and usability, which were based on participant interviews.

All 20 participants were recruited from one site, a US academic medical centre, which may have introduced selection bias and may limit the generalisability of results. Interviewee fatigue was also reported in 1–2 cases, which may have impacted the quality of data obtained towards the end of the interviews. Only participants with moderate or severe HS (Hurley Stage 2 or 3) and receiving care in a hospital HS clinic were included in this study, therefore the results are not generalisable to patients with mild HS or those in a primary care setting.

The three PRO instruments were administered and tested sequentially, starting with the eHSSDD and eHSSQ followed by the eHiSQOL© questionnaire. It is possible that the order in which they were reviewed by participants may have influenced the responses to each of the instruments.

Conclusion

This study provides evidence that the concepts covered in the eHSSDD and the eHSSQ are relevant and important to patients with moderate to severe HS, supporting the content validity of both instruments in this population.
The instructions, recall periods, item meaning and response options for all PRO instruments were relevant and easy for the majority of participants to understand. Furthermore, the findings provide evidence of acceptability and ease of use of the electronic versions of the HSSDD, the HSSQ, and the HiSQOL© questionnaire in patients with moderate to severe HS, regardless of their age, gender or device familiarity and experience.
To further evaluate whether these instruments are suitable for use in patients with moderate to severe HS, next steps for this research will involve assessing the psychometric properties of these questionnaires.

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DATA SHARING STATEMENT

Data from non-interventional studies is outside of UCB's data sharing policy and is unavailable for sharing. Further enquiries can be directed to the corresponding author.

ETHICS

An exemption to formal institutional review board approval for this study was granted by the Penn State Hershey Medical Center Institutional Review Board (Hershey, Pennsylvania, USA) in accordance with the policies of the institution and applicable federal regulations. The need for written informed consent to participate was not required in accordance with these policies.

CONSENT TO PARTICIPATE

To be eligible to participate in this study, participants provided verbal consent and permission to be audio recorded to clinical site staff prior to interviews taking place. Prior to providing verbal consent, participants received a summary of the study, including its risks, benefits and costs. A site clinical staff member worked directly with each verbally consenting participant to ensure that all participants fully understood the study's procedures, risks, and benefits. This consent procedure was reviewed and approved by the Penn State Hershey Medical Center Institutional Review Board (Hershey, Pennsylvania, USA), date of decision October 23, 2020.

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AUTHORS' CONTRIBUTIONS

Substantial contributions to study conception and design: JRI, VC, RR, PG, IP, CDB, JK; substantial contributions to analysis and interpretation of the data: JRI, VC, RR, PG, IP, CDB, JK; drafting the article or revising it critically for important intellectual content: JRI, VC, RR, PG, IP, CDB, JK; final approval of the version of the article to be published: JRI, VC, RR, PG, IP, CDB, JK.

DISCLOSURES

JRI: Receives a stipend as Editor-in-Chief of the *British Journal of Dermatology* and an authorship honorarium from UpToDate; consultant for Boehringer Ingelheim, ChemoCentryx, Citryll, Novartis and UCB Pharma and has served on advisory boards for Insmed, Kymera Therapeutics and Viela Bio, all in the field of hidradenitis suppurativa (HS); co-copyright holder of HiSQOL©, Investigator Global Assessment and Patient Global Assessment instruments for HS; his department receives income from copyright of the Dermatology Life Quality Instrument (DLQI) and related instruments.

VC, RR, IP: Employees and shareholders of UCB Pharma.

CDB: Employee of Evidera.

JK: Speaker for AbbVie, Janssen and UCB Pharma; received grants from Incyte and served as a consultant for AbbVie, ChemoCentryx, InflaRx, Incyte, MoonLake, Novartis, Janssen and UCB Pharma.

REFERENCES

1. Dufour DN, Emtestam L, Jemec GB. Hidradenitis suppurativa: a common and burdensome, yet under-recognised, inflammatory skin disease. Postgrad Med J. 2014;90(1062):216-21;.
2. Napolitano M, Megna M, Timoshchuk EA, Patruno C, Balato N, Fabbrocini G, et al. Hidradenitis suppurativa: from pathogenesis to diagnosis and treatment. Clin Cosmet Investig Dermatol. 2017;10:105-15.
3. Mercieca-Bebber R, King MT, Calvert MJ, Stockler MR, Friedlander M. The importance of patient-reported outcomes in clinical trials and strategies for future optimization. Patient Relat Outcome Meas. 2018;9:353-67.
4. Finlay AKG. Dermatology Life Quality Index (DLQI)-a simple practical measure for routine clinical use. Clin Exp Dermatol 1994;19(3):210-16.
5. Ali FM, Johns N, Finlay AY, Salek MS, Piguet V. Comparison of the paper-based and electronic versions of the Dermatology Life Quality Index: evidence of equivalence. Br J Dermatol. 2017;177(5):1306-15.
6. Montero-Vilchez T, Diaz-Calvillo P, Rodriguez-Pozo JA, Cuenca-Barrales C, Martinez-Lopez A, Arias-Santiago S, et al. The Burden of Hidradenitis Suppurativa Signs and Symptoms in Quality of Life: Systematic Review and Meta-Analysis. Int J Environ Res Public Health. 2021;18(13):6709.
7. Thorlacius L, Esmann S, Miller I, Vinding G, Jemec GBE. Development of HiSQOL: A Hidradenitis Suppurativa-Specific Quality of Life Instrument. Skin Appendage Disord. 2019;5(4):221-29.
8. Zouboulis CC, Chernyshov PV. Hidradenitis suppurativa-specific, patient-reported outcome measures. J Eur Acad Dermatol Venereol. 2021;35(7):1420-21.
9. Vellaichamy G, Braunberger TL, Jones JL, Peacock A, Nahhas AF, Hamzavi IH. Patient-reported outcomes in hidradenitis suppurativa. G Ital Dermatol Venereol. 2019;154(2):137-47.
10. Kirby JS, Thorlacius L, Villumsen B, Ingram JR, Garg A, Christensen KB, et al. The Hidradenitis Suppurativa Quality of Life (HiSQOL) score: development and validation of a measure for clinical trials. Br J Dermatol. 2020;183(2):340-48.
11. Thorlacius L, Ingram JR, Villumsen B, Esmann S, Kirby JS, Gottlieb AB, et al. A core domain set for hidradenitis suppurativa trial outcomes: an international Delphi process. Br J Dermatol. 2018;179(3):642-50.
12. ClinicalTrials.gov. A Study to Test the Long-term Treatment of Bimekizumab in Study Participants With Moderate to Severe Hidradenitis Suppurativa (BE HEARD EXT). 2021. Available from: https://www.clinicaltrials.gov/ct2/show/study/NCT04901195 [Accessed 27 October 2022].
13. ClinicalTrials.gov. A Study to Evaluate the Efficacy and Safety of Bimekizumab in Study Participants With Moderate to Severe Hidradenitis Suppurativa (BE HEARD I). 2022. Available: https://clinicaltrials.gov/ct2/show/NCT04242446 [Accessed 27 October 2022]
14. ClinicalTrials.gov. A Study to Evaluate the Efficacy and Safety of Bimekizumab in Study Participants With Moderate to Severe Hidradenitis Suppurativa (BE HEARD II). 2020. Available from: https://clinicaltrials.gov/ct2/show/record/NCT04242498 [Accessed 27 October 2022].
15. FDA. Patient-Reported Outcome Measures: Use in Medical Product Development to Support Labeling Claims. 2009.
16. U.S Food and Drug Administration F. Patient-Focused Drug Development: Collecting Comprehensive and Representative Input Guidance for Industry, Food and Drug Administration Staff, and Other Stakeholders. 2020.
17. U.S Food and Drug Administration F. Patient-Focused Drug Development: Methods to Identify What Is Important to Patients Guidance for Industry, Food and Drug Administration Staff, and Other Stakeholders. 2022.
18. U.S Food and Drug Administration F. Patient-Focused Drug Development: Selecting, Developing, or Modifying Fit-for Purpose Clinical Outcome Assessments. 2022.
19. Kirby JS, Hereford B, Thorlacius L, Villumsen B, Ingram JR, Garg A, et al. Validation of global item for assessing impact on quality of life of patients with hidradenitis suppurativa. Br J Dermatol. 2021;184(4):681-87.
20. Coons SJ, Gwaltney CJ, Hays RD, Lundy JJ, Sloan JA, Revicki DA, et al. Recommendations on evidence needed to support measurement equivalence between electronic and paper-based patient-reported outcome (PRO) measures: ISPOR ePRO Good Research Practices Task Force report. Value Health. 2009;12(4):419-29.

21. van Muilekom MM, Teela L, van Oers HA, van Goudoever JB, Grootenhuis MA, Haverman L. Patients' and parents' perspective on the implementation of Patient Reported Outcome Measures in pediatric clinical practice using the KLIK PROM portal. Qual Life Res. 2022 Jan;31(1):241-54.
22. Apple. Research and Care: Important discoveries are at your fingertips. 2015. Available from: https://www.researchandcare.org/researchkit/ [Accessed 27 October 2022].
23. Meirte J, Hellemans N, Anthonissen M, Denteneer L, Maertens K, Moortgat P, et al. Benefits and Disadvantages of Electronic Patient-reported Outcome Measures: Systematic Review. JMIR Perioper Med. 2020;3(1):e15588.

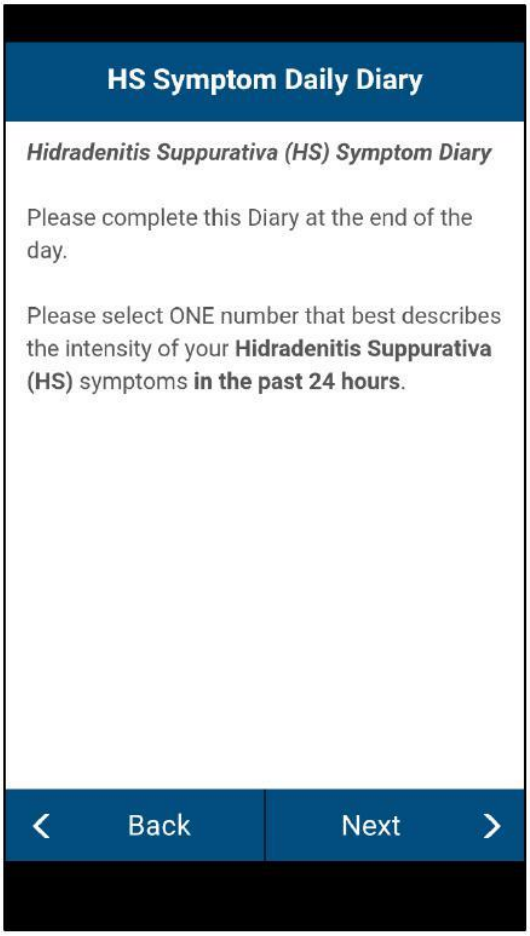
FIGURE LEGENDS

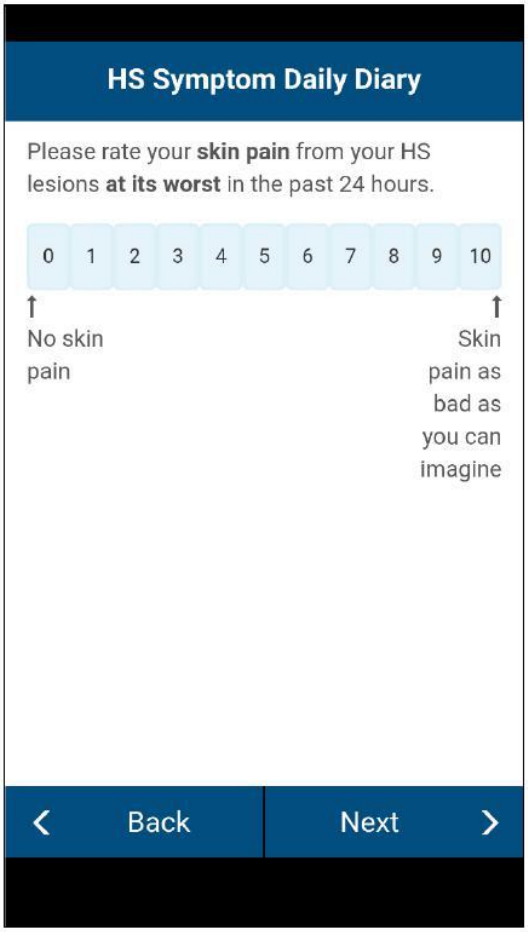
Figure 1. Screenshots from eHSSDD
eHSSDD: electronic Hidradenitis Suppurativa Symptom Daily Diary; HS: hidradenitis suppurativa.

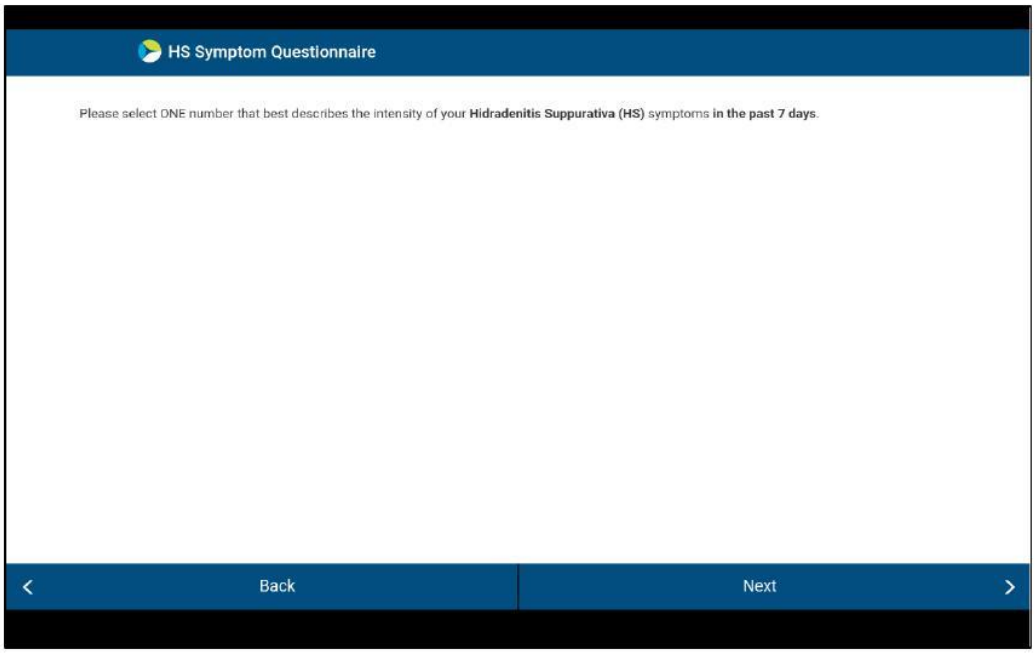
Figure 2. Screenshots from eHSSQ
eHSSQ: electronic Hidradenitis Suppurativa Symptom Questionnaire; HS: hidradenitis suppurativa.

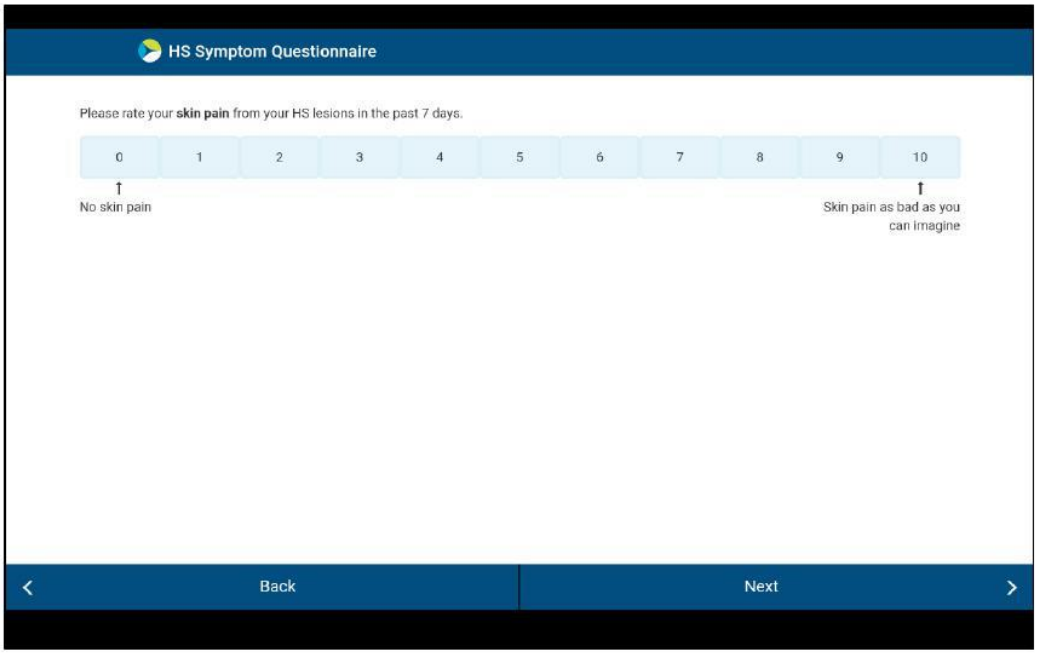
Figure 3. Screenshots from eHiSQOL© questionnaire
eHiSQOL©: electronic Hidradenitis Suppurativa Quality of Life Questionnaire; HS: hidradenitis suppurativa.

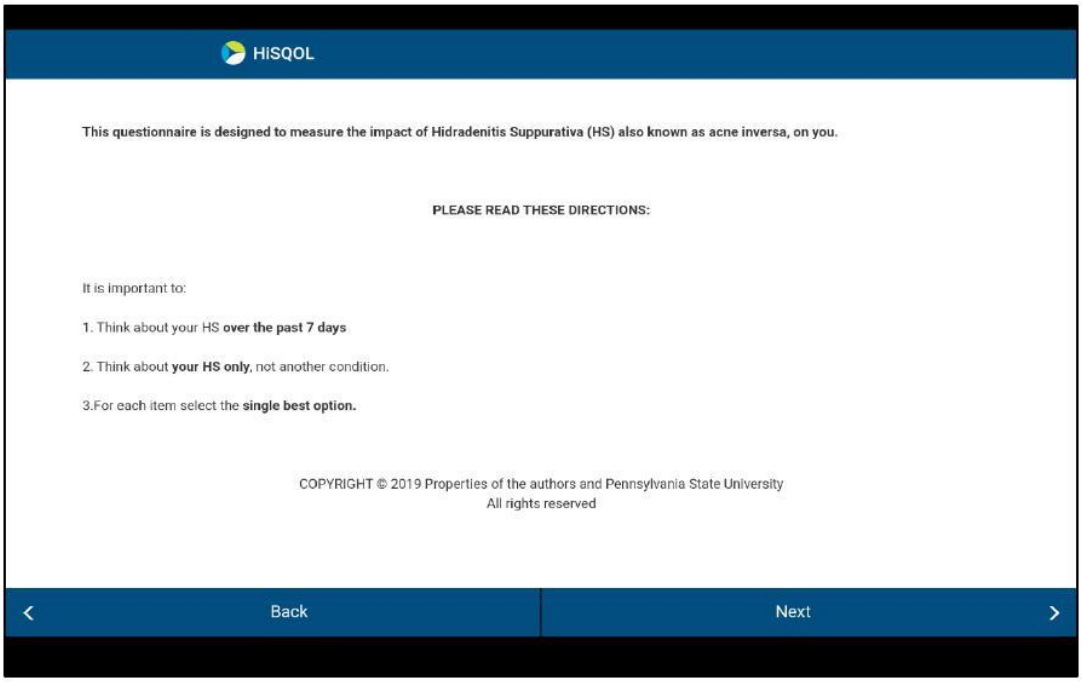
Figure 4. Participant reporting of (a) HS signs and symptoms and (b) impact of HS
HS: hidradenitis suppurativa.

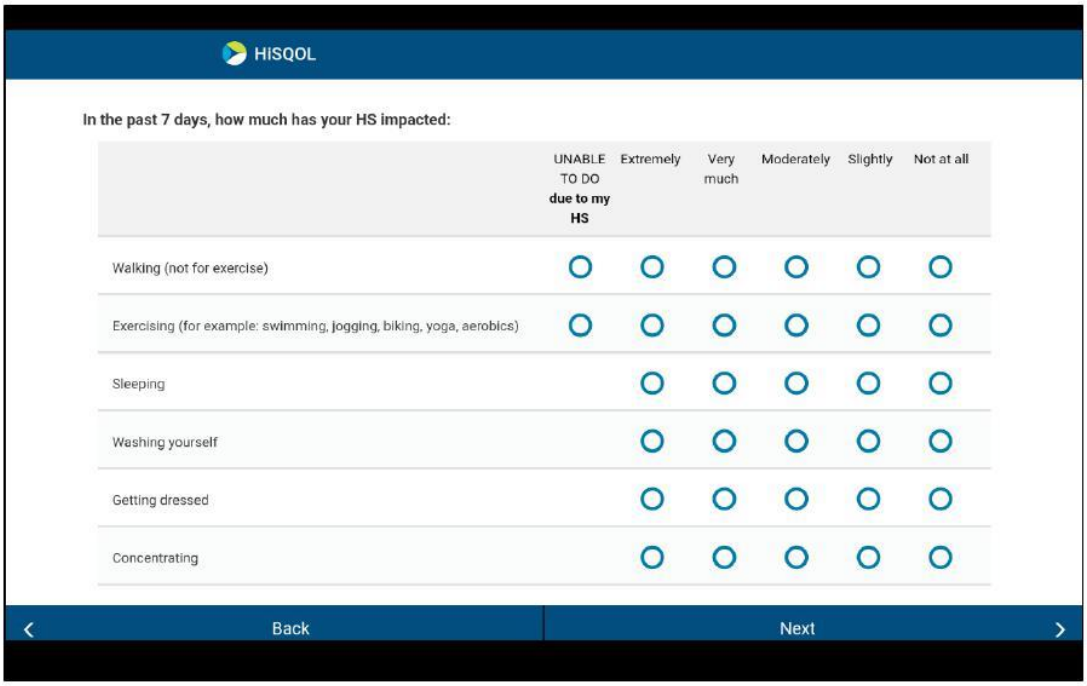












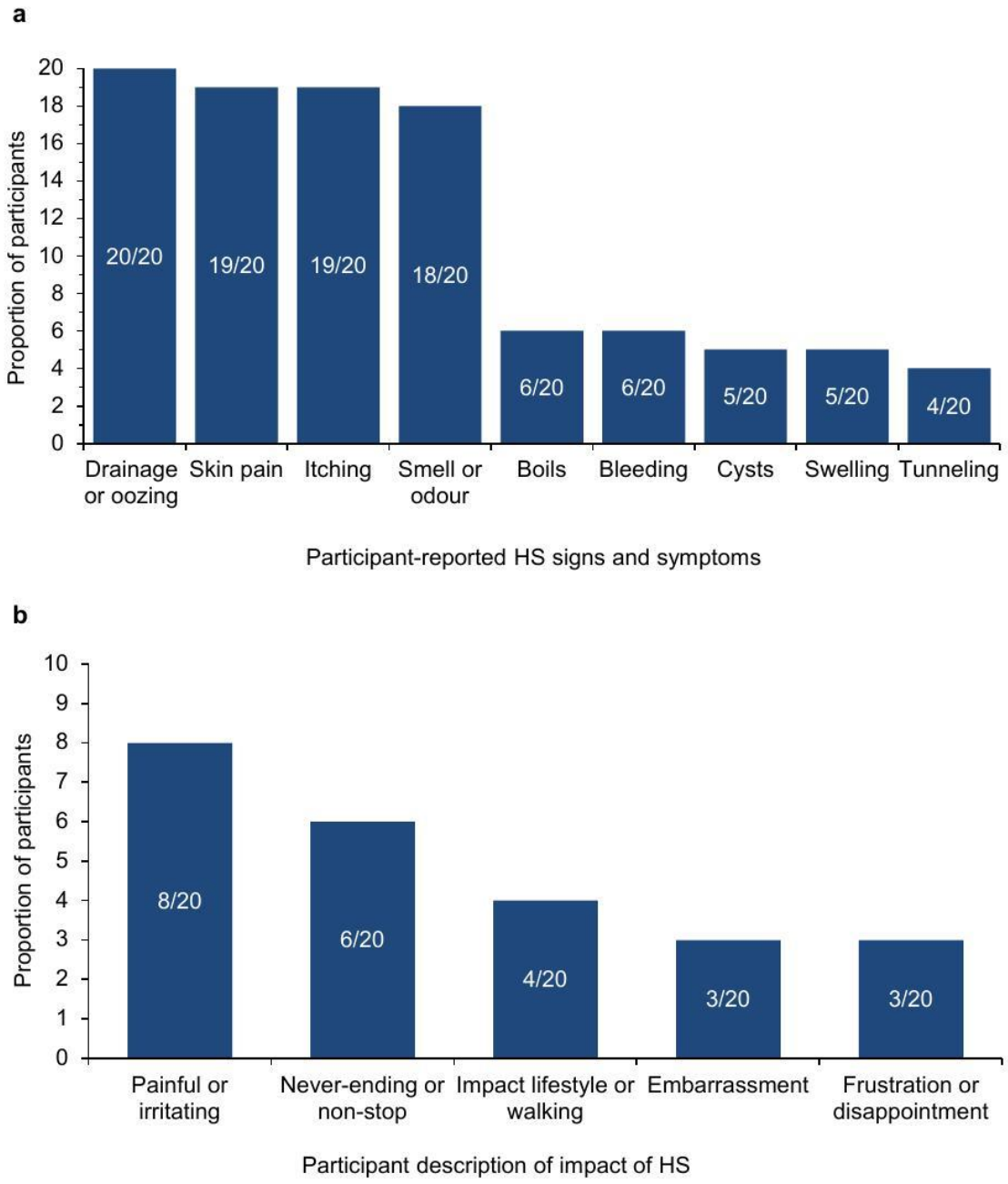


Table 1. Median item symptom scores for eHSSDD and eHSSQ (n=20 participants)

Item symptoms	Item score, median (range)
eHSSDD	
Worst skin pain	5.5 (0.0–10.0)
Average skin pain	5.5 (0.0–10.0)
Worst itch	6.0 (0.0–10.0)
Smell or odour	3.0 (0.0–10.0)
Drainage or oozing	4.5 (0.0–10.0)
eHSSQ	
Skin pain	6.0 (0.0–10.0)
Itch	5.0 (0.0–10.0)
Smell or odour	3.0 (0.0–9.0)
Drainage or oozing	5.5 (0.0–10.0)

eHSSDD: electronic Hidradenitis Suppurativa Symptom Daily Diary; eHSSQ: electronic Hidradenitis Suppurativa Symptom Questionnaire.