ABSTRACT
The Health Assessment Questionnaire (HAQ), developed in 1979, is one of the original measurements of quality of life in patients with rheumatoid arthritis. The HAQ has been utilized in several chronic rheumatologic diseases, including psoriatic arthritis. While the HAQ was validated for use in a psoriatic arthritis population, it has been mostly studied in populations with psoriatic arthritis and mild psoriasis. Its use in psoriatic arthritis with moderate to severe psoriasis has raised concerns due to the differences in disease characteristics, including the higher impact of psychosocial factors. Additionally, the HAQ does not assess treatment and disease factors specific to psoriasis patients. Nevertheless, the HAQ is a valuable assessment tool, evidenced by more than 30 years of use in more than 100,000 studies, and its easy-to-implement format; however, its use as the sole outcome measure for psoriatic arthritis severity is discouraged and practitioners should develop an understanding of its shortcomings.

INTRODUCTION
The Health Assessment Questionnaire (HAQ), originally named the Arthritis Assessment Questionnaire, was developed and implemented in 1979 by James Fries, M.D., and colleagues at Stanford University to measure quality of life of patients with rheumatoid arthritis (RA).\(^1\) It was officially adopted by the Arthritis, Rheumatism and Aging Medical Information System in 1980 and continues to be copyrighted by this group today in order to control validity and standardization of the questionnaire.\(^2,3\)

The goal of developing this questionnaire was to create a tool to examine “5 patient-centered dimensions of health outcomes”: death, disability, discomfort, iatrogenic, and economic. The original HAQ validation study examined 20 volunteers (18 women and 2 men, ages 34-75 years old) with rheumatoid arthritis (RA)\(^1\) at the Stanford Immunology Clinic or Stanford Outcome in RA Study. This original version of the questionnaire consisted of an interview format of 100 questions that would later be reduced via physician appraisal, patient feedback, and correlation matrices to 20 questions that is known as the HAQ-Disability Index (HAQ-DI).\(^1,2,4,5\) The reduced questionnaire was then validated for use via mail, telephone, and office interview implementation, depending on patient

Keywords: psoriatic arthritis, psoriasis, Health Assessment Questionnaire, quality of life, psychosocial impact
preference/ease of use. More recently, Mackenzie et al. showed that web-based use of the HAQ in psoriatic arthritis patients was equally effective as paper-based implementation.

As the use of the questionnaire in clinical and observational studies increased and it was recognized to capture general concepts across chronic disease, its name was modified from the Arthritis Assessment Questionnaire to the HAQ to signify its multiple applications. This new name better reflected the questionnaire’s diverse use in osteoarthritis, juvenile RA, systemic lupus erythematosus, ankylosing spondylitis, fibromyalgia, systemic sclerosis, and psoriatic arthritis. With the increased popularity in use, more studies researching its content and scoring methods arose. For example, in 1996, Tennant et al. used Rasch modeling, an analysis used to determine optimal psychometric properties (i.e. unidimensionality) of health status instruments, in order to clarify that the HAQ scoring was more consistent with an ordinal scale instead of a continuous or linear scale as originally believed. Thus, the authors recommended a change in scoring method from the subscale model, which calculated the average of eight subscales scored from 0 to 3, to a full 60-point approach, which calculated an overall sum of all 20 items scored from 0 to 3. Yet, this change was never adopted and the subscale method continues to be used today as discussed below.

DISCUSSION

HAQ Versions

A common source of confusion with HAQ use comes from its multiple formats and versions. The full HAQ includes the HAQ-Disability Index (HAQ-DI – see description below), a 15-cm pain visual analog scale (VAS), a review of medical history, medical conditions, and diagnoses over the past 6 months, a global VAS on health status and health behaviors, general questions on exercise, medications, and medication side effects, along with the SF-36 Health Survey (which addresses physical problems, emotional problems, and bodily pain). The full HAQ is often updated and supplemented with new drug side effects, dollar costs, and pertinent issues in the field. The HAQ-DI, which is most often implemented as a solo instrument, consists of 20 questions (as described above) that are separated into eight component sets. These sets include 1) dressing and grooming – two items, 2) arising – two items, 3) eating – three items, 4) walking – four items, 5) hygiene – three items, 6) reach – two items, 7) grip – three items, and 8) activities – five items. The HAQ-DI concludes with an overall rating of ability in activities, pain, and health. The HAQ-DI remains relatively unchanged since its debut in 1980. Finally, there is also the Short HAQ, a two-page tool that includes the HAQ-DI, patient global VAS, and pain VAS.

Overall concerns regarding the HAQ include the difficulty with scoring and the fact that it is not a true linear scale. As discussed previously, Tennant et al. used Rasch modeling to show that the HAQ scoring was more consistent with an ordinal scale rather than a continuous or linear scale. This causes an issue with scoring since the same increase at a lower score (i.e. going up 0.25 units from 0.5 to 0.75) is no longer equal to the same increase at a higher score (i.e. going from 2.5 to 2.75). Wolfe (2002) showed that an increase in score from 0-1 has a much greater impact than the same numeric increase at higher ranges of the scoring scale. This makes it difficult to compare patient populations or even the same patient over time.

Additionally, there is concern that both ceiling and floor effects may exist, which would result in scores at either end of the HAQ scoring spectrum being misinterpreted. For example, a person with a...
Successful HAQ Modifications for Specific Populations

Over the years, the HAQ has been translated to more than 60 languages and modified in an attempt to better fit the needs of individual diseases outside of RA.\(^5,12\) One successful modification developed by Singh et al. is the Childhood HAQ (CHAQ).\(^6\) The CHAQ assesses health status in children as young as 1 year old and has been validated in patients with juvenile RA and dermatomyositis while being used in multiple other diseases, including spina bifida.\(^13-17\)

Another successful modification in an adult population was the HAQ-S, developed by Daltroy et al. in 1990 to address spondyloarthropathies and spinal involvement, since RA focuses on peripheral joint disease. HAQ-S consists of the addition of two spinal domains (SPAR-1 and SPAR-2), a 15-cm VAS for stiffness, as well as a series of five questions derived from a previous study that identified problematic activities. These include a person’s ability to carry heavy packages, sit for long periods of time, work at a flat-topped table, drive a car, look in the rearview mirror, and turn his or her head to drive in reverse. The HAQ-S was well-accepted as a more suitable quality-of-life measurement for patients with spondyloarthropathies.\(^18\)

HAQ Validation in Psoriatic Arthritis

Psoriatic arthritis occurs in approximately 30% of psoriasis patients and overall in 0.3-1% of the general population.\(^19\) While similar to RA in the fact that it is an inflammatory arthritis, there are many differences in the pattern of joint involvement and characteristics of the disease. For example, psoriatic arthritis often involves distal joints in a ray pattern, where all three joints of a digit are affected while other digits are spared, and may include a spondyloarthropathy compared to the more symmetrical peripheral involvement in RA.\(^19\) Additionally, psoriatic arthritis patients suffer from the inflammatory skin condition of psoriasis and up to 87% of patients also have nail involvement.\(^20\)

Due to the underlying similarities as an inflammatory arthritis, the HAQ was naturally applied to psoriatic arthritis. The most commonly quoted validation study for use of the HAQ in psoriatic arthritis was completed by Blackmore et al. in 1995.\(^20\) The group compared the use of the HAQ to the modified version validated for patients with spondyloarthropathies, HAQ-S, in a psoriatic arthritis population. They found that both versions served as clinical measures of function and pain, thus validating the use of the HAQ in psoriatic arthritis, but neither version correlated with disease severity as measured by the accepted Psoriasis Area Severity Index (PASI; mean score of 8.9).\(^20\) Thus, a further modification, the HAQ-SK, was developed to better assess patients with psoriatic arthritis by Husted et al. in 1995. HAQ-SK added skin modifications using three questions on bending knees/elbows, stretching/reaching, and using hands, a 15-cm psoriasis severity VAS, and three open-ended questions focusing on how psoriasis affects life and daily functioning. Husted et al. studied 118 patients with psoriatic arthritis (96% with psoriasis vulgaris, 82% with nail involvement), but unfortunately found no significant performance change for the HAQ-SK compared to the HAQ (mean global HAQ of 0.55 compared to mean HAQ-SK of 0.56).\(^21\) Additionally, neither version was associated with psoriasis severity. The only correlation found between psoriasis severity (as measured by PASI) was the psoriasis severity VAS based on an r=0.49, which the study defined as a high agreement since r≥0.40. However, it is important to take into account that the patients in this study also had overwhelmingly mild psoriasis and psoriatic arthritis with a mean PASI of only 8.8, mean inflamed joint count of 6.4,
and mean effusion count of 2. Interestingly, the open-ended questions showed 20% had restricted social activities, 47% had mood disturbances or low self-esteem, and 30% had limited movement or physical discomfort. Thus, HAQ-SK was never adopted for widespread use in psoriatic arthritis, but the concerns for the use of HAQ in the psoriatic arthritis population due to the lack of correlation with psoriasis severity and the unmeasured role of psychosocial factors still remained.

It seems logical that the detrimental effects of psoriasis should correlate with each patient’s quality-of-life measure. In 2001, Sokoll and Helliwell showed that HAQ scores did rise with increasing psoriasis severity, however, this was not statistically significant, possibly due to a lack of power from their sample size of only 47 patients. Of note, the majority of these patients still only had clinically mild skin disease, with no formal objective measure of severity. Interestingly, the study matched RA and psoriatic arthritis patients and found that peripheral joint disease was greater in patients in RA, while the function and quality-of-life scores were the same in both groups. The authors concluded that this was likely due to skin disease burden in psoriatic arthritis since skin disease causes issues in self-esteem and involvement of hands/genitals may affect self-care and hygiene. Yet, in 2011, Rosen et al. compared multiple quality-of-life measures, including the HAQ, in 201 patients with psoriasis only and 201 patients with psoriatic arthritis in addition to psoriasis. As expected, they found that patients with psoriatic arthritis had a significantly higher score on the HAQ demonstrating a greater functional disability related to the additional joint disease in psoriatic arthritis patients. However, the psoriatic arthritis patients had an extremely low level of active skin disease (mean PASI 3.9), which was even lower than the psoriatic population (mean PASI 5.5). Notably, the HAQ was the only quality-of-life measure to correlate with the number of active and damaged joints.

Studies also have compared the HAQ to other quality-of-life measures, such as the SF-36, in psoriatic arthritis. Husted et al. (2001) compared quality-of-life measures in psoriatic arthritis versus RA patients and concluded that both HAQ and SF-36 should be given to patients with psoriatic arthritis to better assess quality of life. Once again, the cohort of patients with psoriatic arthritis had relatively mild skin disease with a mean PASI of 7.5. Taylor and MacPherson did a similar study in 2007 by randomly selecting 257 patients with confirmed psoriatic arthritis (no measurement of psoriasis severity) to give both the HAQ-DI and SF-36 physical function subscale to compare the most appropriate quality-of-life measure. Unlike Husted et al., Taylor and MacPherson found significant psychometric advantages to using SF-36 over HAQ-DI in psoriatic arthritis based on a Rasch analysis showing that SF-36 had better distributional properties, longer scale length, less differential item functioning, and fewer misfit items. These psychometric properties make SF-36 a better assessment tool when comparing scores across different diseases and in intervention studies since SF-36 will better detect improvement in patients with low levels of disability compared to HAQ-DI.

On a promising note, HAQ has been applied to multiple clinical trials in psoriatic arthritis and showed a significant decrease in disability in scores to represent improved function with treatment. Concerns of Using HAQ in Psoriatic Arthritis

As shown by the above-mentioned studies, there are still points of concern for use of the HAQ or any of its subsets in patients with psoriatic arthritis. Foremost, most validation studies have looked at patients with mild psoriasis (PASI < 10 on average) or have not objectively assessed psoriasis severity. These studies may not have been sufficient to show the true impact on the quality of life and function in daily life of patients with more severe skin involvement and may be part of the reason that the various HAQ modifications have proven to have no significant trend with increasing psoriasis severity. This issue also will impact the amount of change in HAQ score over time when a psoriatic arthritis patient is receiving treatment with a predominant effect on skin involvement and not on joints.

Additionally, clinical trials with effective psoriatic arthritis treatments have shown a trend of decreasing HAQ score and thus assumed this to identify decreasing functional disability; however, the change in scores is difficult to interpret without knowing the true “minimal clinically important difference” (MCID) for psoriatic arthritis. The
MCID defines the amount of change in the HAQ score that is not only statistically significant, but also clinically significant. The accepted MCID for RA is 0.22, but only one psoriatic arthritis study, a phase III trial using etanercept, calculated the MCID and found that it may be closer to 0.3 or even 0.4 when standard error of measurement was taken into account. Further research is needed to determine an accurate MCID for psoriatic arthritis in order to interpret changes in HAQ appropriately.

Apart from misinterpreting the HAQ score, a common concern is that HAQ fails to capture or even take into consideration the psychosocial problems associated with the underlying skin disease of psoriasis that greatly impact quality of life. The psychosocial impact may be greater than patients with RA since many psoriatic arthritis patients suffer from visible lesions that inhibit them from doing activities that they are otherwise physically capable of doing. This is exemplified by the HAQ-SK study, which showed 20% of the patients identifying restrictions in social activities and reduced work productivity in the added open-ended question. The combination of joint and skin involvement in psoriatic arthritis has already been shown to have a greater impact on patients’ quality of life and increase rates of depression and anxiety compared to psoriasis alone. Thus, it is complex, yet important, to keep in mind the role that the mental health status and psychosocial well-being of these patients plays in their functional disability as well.

Furthermore, the HAQ does not adequately measure activities affected by some subsets of psoriasis. For example, there is no measure regarding the ability to apply topical treatment and inject medications. In some subsets of psoriasis, such as palmoplantar and intertriginous, there are many activities that may be affected but would not be represented in the current HAQ parameters. While HAQ is an assessment tool for psoriatic arthritis patients, it is important not to ignore the significant effect that psoriasis has on these patients’ quality of life that would not be a consideration in other rheumatologic conditions, such as RA.

It may be advantageous to use the HAQ as a screening tool in clinical trials of psoriasis patients with psoriatic arthritis for psoriasis treatments since the same treatments also may be helpful for controlling their psoriatic arthritis. Definitive clinical trials measuring signs and symptoms, inhibition of radiographic progression, quality of life, and disability would best follow such screening studies in order to confirm and expand upon the preliminary results.

CONCLUSION
With more than 35 years of use, the HAQ provides advantages of quick and easy administration along with wide-scale use in more than 100,000 clinical and observational trials. However, it is important to note that the HAQ was originally validated in an RA population and has been widely studied in psoriatic arthritis patients with mild psoriasis. More studies would be beneficial to confirm the true validity, reliability, and MCID of the questionnaire in a psoriatic arthritis population with more severe psoriasis.

While modifications have not been statistically significant in the past for psoriatic arthritis, it may be useful to reassess these past modifications or design a new version to be tested in a psoriatic arthritis population with more severe psoriasis and sub-populations such as palmoplantar psoriasis. These modifications should most importantly address the elements of skin-related quality of life that is both unique and integral to the patients who have psoriasis with psoriatic arthritis. The concerns revolving around the HAQ in psoriatic arthritis should be taken into consideration with each implementation and it should not be used solely as a measure of psoriatic arthritis.

REFERENCES


