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ORIGINAL ARTICLE

Initiating value-based healthcare in psoriasis: Proposing a value-based outcome set for daily clinical practice

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Abstract

Background: With the current trend in healthcare moving towards a more value-based approach, it is essential to understand what value encompasses.

Objectives: To develop an actionable value-based outcome set (VOS) for daily practice.

Methods: A mixed method approach was used consisting of four phases. Formerly, a systematic review was conducted, providing an overview of all patient-relevant outcomes defined in current literature. These 23 outcomes were then presented to a group of patients, using a modified nominal group technique (NGT), to establish whether these results represented all of their relevant outcomes. Subsequently, these outcomes were ranked according to importance by patients attending our academic specialized psoriasis clinic. A review of the literature was performed to assess which instruments were available and suitable to evaluate the outcomes in this VOS. Finally, a pilot feasibility test was performed amongst patients.

Results: Of the 23 outcomes, two were omitted from the ranking exercise after the NGT. In the ranking exercise, 120 patients participated. The median age was 50.0 (IQR 25.0) years and 36.7% were female. Median PASI score was 2.4 (IQR 5.2), and treatments varied from topicals to biologicals. The outcomes scored as most important were *symptom control*, *treatment efficacy*, *confidence in care* and *control of disease*. The least important outcomes were *comorbidity control*, *productivity* and *cost of care*. A significant difference was shown between the ranking of the outcomes ($p < 0.001$). In total, 12 instruments were selected, which are reported by both patient and provider, to measure the outcomes in this VOS. Median completion time for the patient part was 30 min (IQR 2.8).

Conclusions: This VOS is a first proposal to evaluate psoriasis care in a value-based manner. Measuring these outcomes can enable us to critically appraise and improve current care processes, within the reality of available resources, thereby increasing value for patients.

INTRODUCTION

Currently, healthcare expenditures are at an all-time high as the U.S. (2020) and Europe (2019) spent $4.1 trillion (19.7% of the gross domestic product [GDP]) and €1.39 trillion (9.9% of the GDP) on healthcare, respectively.[1,2] Worrisomely, an increase in healthcare spending does not seem to equate to better health outcomes or quality of care.[3–5] In response to the alarming rises in healthcare cost, strategies focused on flat budget cuts are often applied.

However, without regards for improving outcomes, such strategies can be counterproductive and lead to less effective and low-quality care. Value-based healthcare (VBHC) is nowadays increasingly considered as a paradigm to provide a solution for this problem. The focus of VBHC lies on providing high-value care – improving quality and performance of care whilst simultaneously using resources in a sustainable and transparent way.[6] Value is defined as the patient-relevant outcomes achieved divided by the costs needed to achieve these outcomes.[6] The strategy to transform current healthcare systems into high-value healthcare delivery systems encompasses six components (Table 1).[6] Interestingly, 90% of the healthcare expenditures in the US was due to chronic and mental disorders.[1] In Europe, similar numbers were seen as 70%–80% of countries' healthcare expenditures were spent on chronic disease management.[7] Chronic diseases thus put a considerable strain on healthcare budgets, and management of chronic diseases, including chronic inflammatory skin diseases, could benefit from a VBHC approach.

One disease that could benefit from a VBHC approach is psoriasis. Psoriasis is a chronic inflammatory skin disease with a prevalence of 0.1%–11%.[8] Symptoms may vary from pruritus to pain. In addition, skin lesions can be disfiguring, depending on their size and localization.[8,9] Psoriasis has been shown to significantly impact patients' quality of life (QoL).[10] Furthermore, it is associated with psoriatic arthritis and numerous other comorbidities, such as hypertension, dyslipidemia and diabetes.[11]

Systematically measuring outcomes that are important to patients is an essential part of VBHC as it can be an important driver for healthcare systems to improve the care they deliver.[12,13] In clinical trials, core outcome sets (COS), consensus-driven minimum sets of outcomes, help in standardizing the reporting of outcomes. However, their applicability remains limited for clinical practice as the scope, setting and stakeholders are different than those from clinical trials. To date, there is no pragmatic set of outcomes available that should be documented and captured to grasp the overall value a healthcare professional (HCP) provides for a psoriasis patient in daily practice. The objective of this study was therefore to develop a first proposal for an actionable value-based outcome set (VOS) for clinical practice which contains outcomes that are truly relevant for patients.

MATERIALS AND METHODS

There is no uniform methodology on how to develop outcome sets for daily clinical practice. Therefore, we based our methodological approach on the methods used by four known outcome set initiative groups; the Outcome Measures in Rheumatology (OMERACT), the Consensus-based Standards for the selection of health Measurement Instruments (COSMIN), the Core Outcome Measures in Effectiveness Trials (COMET) and the International Consortium for Health Outcomes Measurement (ICHOM).[14–17]

A mixed method approach was used consisting of four phases (a more detailed description can be found in the eMethods). Formerly, a systematic review (SR) was conducted, providing an overview of all patient-relevant outcomes defined in current literature.[18] These 23 outcomes were then presented to a group of patients, using a modified nominal group technique (NGT), to establish whether these results represented all of their relevant outcomes. Subsequently, these outcomes were ranked according to importance by 120 patients attending our academic specialized psoriasis clinic (PsoPlus) at Ghent University Hospital, Belgium.[19,20] A review of the literature was performed to assess which instruments were available and suitable to evaluate the outcomes in this VOS. Finally, we explored the feasibility of the VOS in a pilot test involving 10 patients.

Ethical conduct of the survey

This study was approved by the Ethics Committee of the Ghent University Hospital (B670201941327) and was conducted according to the Declaration of Helsinki. All patients provided written informed consent.

Statistical analyses

Data were analysed using a descriptive approach with absolute and percentage frequencies for categorical data, and

TABLE 1 Succinct overview of value-based healthcare

Central aim of VBHC	Delivering high value over the full cycle of care
Definition of value	Patient-relevant outcomes achieved divided by the costs needed to achieve these outcomes
Key processes in VBHC delivery	• Systematic measurement of outcomes and cost • Reporting and comparing outcomes • Improvement of the care delivery process based upon the observed value • Reducing low-value care and rewarding high-value care through reformed payment systems
Strategic components to transform current healthcare systems into high-value healthcare delivery systems	1. Organize into IPUs around a medical condition 2. Measure outcomes and cost for every patient 3. Reform payment systems (fee-for-value instead of fee-for-service) 4. Integrate care delivery systems across separate facilities 5. Expand geographic reach 6. Build an IT platform that enables digital data monitoring centralized around the patient

Abbreviations: IPU, Integrated Practice Unit; IT, Information Technology; VBHC: Value-based Healthcare.

means/medians and standard deviations/ranges for continuous variables. A Friedman test was performed to assess if the results of the ranking exercise were significant. In addition, a rank-ordered logit analyses were performed to evaluate which variables influenced the ranking of each outcome. All statistical tests were two-tailed. Statistical analyses were performed with SAS, version 9.4 (SAS Institute).

RESULTS

Patient panel

In total, 8 patients were selected to participate in the modified NGT. The outcome *information from other sources than healthcare professionals* was deemed inappropriate as this outcome cannot be influenced by healthcare professionals in daily practice and should therefore not be in this set. The outcome of *health-related quality of life (HrQoL)* was also deemed inappropriate as patients could not understand the difference between this outcome and other QoL-related outcomes. Therefore, these two outcomes were omitted from the ranking exercise, leaving 21 outcomes to be ranked.

Ranking exercise

In total, 120 patients took part in the ranking exercise. Patient characteristics can be found in Table 2. The median age was 50.0 (IQR 25.0) years and 36.7% were female. Median PASI score was 2.4 (IQR 5.2) and median duration of psoriasis was 17.0 (IQR 20.0) years. Almost all patients (87.5%) had one or more comorbidities. Treatments varied from topicals to biologicals.

In the rank-ordered logit model, the outcome *cost of care (patient)* was chosen as the reference outcome. Due to the vast amount of variables collected, and low number of observations for some of these variables, this model was simplified by combining certain characteristics (eResults). In the ranking exercise, the highest-ranked outcome received 21 points and the lowest received only 1 point. The outcomes scored as most important by psoriasis patients were *symptom control* (mean ranking score 15.8 SD ± 4.5), *treatment efficacy* (13.9 ± 5.8), *confidence in care* (13.5 ± 5.1) and *control of disease* (13.4 ± 4.8) as shown in Table 3. The least important outcomes were *comorbidity control* (9.0 ± 5.6), *productivity* (8.0 ± 5.7) and *cost of care* (cost for the patient 6.3 ± 5.4 and societal cost 5.5 ± 4.6 respectively). The Friedman test showed a significant difference between the ranking of the outcomes ($p < 0.001$).

When considering the variables influencing the overall ranking, gender ($p = 0.001$), age ($p < 0.001$), disease duration ($p = 0.02$), PASI score ($p = 0.01$), depression (suspicion or case) ($p = 0.001$), higher education ($p = 0.03$), secondary education ($p = 0.001$), having need for support ($p < 0.001$), previously going to a hospital ($p = 0.03$), living with parents ($p < 0.001$), having the facial/scalp area affected ($p = 0.03$) were found, amongst others, to have a significant impact (Table 3 and Table S1).

When looking more in detail, females ranked the outcome *intimate relationships* and *productivity* lower than men (model effect mean −1.91, 95% CI −2.89 to −0.92; $p < 0.001$ and −1.49, 95% CI −2.45 to −0.53; $p = 0.002$ respectively). Furthermore, an increasing disease duration was associated with a decreased ranking of the outcome *symptom control* (per 10 years −0.38, 95% CI −0.71 to −0.05; $p = 0.02$). Age had a significant effect on the ranking of several outcomes (Table 3). Comorbidities such as depression also had a significant effect on the ranking of several outcomes. Interestingly, higher-educated people ranked the outcomes *social activity*, *intimate relationships*, *symptom control*, *treatment efficacy*, *daily activity* and *emotional well-being* higher than lower-educated people, whilst people with a secondary degree ranked these outcomes lower than lower-educated people. Patients with facial/scalp involvement ranked, amongst others, the outcomes *intimate relationships*, *social activity* and *daily activity* lower. Those who previously came from another hospital ranked the outcome *confidence in care* lower than those who came from a GP or dermatology practice, and those who did not recently visit a HCP (−1.64, 95% CI −3.25 to −0.04; $p = 0.05$). Finally, patients in need of practical and/or emotional support ranked the outcome *social activity* higher than those who did not (1.66, 95% CI 0.34 to 2.99; $p = 0.01$).

Selecting instruments

Here, we propose suitable measurement instruments for each outcome. In total, 12 instruments were selected, of which eight are reported by the patient and four by the provider (eResults). The final VOS is depicted in Figure 1.

Feasibility test

All 10 patients completed the entire patient part of the VOS. Overall median time to complete the VOS was 30 min (IQR 2.8). Most patients (90%) evaluated the amount of questions as acceptable. In addition, 90% of the patients was willing to complete the VOS twice a year or more.

DISCUSSION

Value-based healthcare has already been shown to be beneficial for chronic inflammatory diseases such as inflammatory bowel disease.[21] The potential of VBHC in dermatology has yet to be fully explored, however, it has the promise to improve care for patients with chronic inflammatory skin diseases (e.g. psoriasis, atopic dermatitis, vitiligo and hidradenitis suppurativa), as these are often associated with a high multidimensional disease burden and multiple comorbidities, which would benefit greatly from

TABLE 2 Characteristic of the patients performing the ranking exercise

Characteristics	*n* = 120
Age (years)	
Median and IQR	50.0 (25.0)
Range	18–81
Female [*n* (%)]	44 (36.7%)
PASI[a]	
Median and IQR	2.4 (5.2)
Range	0–31.2
Duration of psoriasis (years)	
Median and IQR	17.0 (20.0)
Range	2 months – 63 years
Treatment [*n* (%)][b]	
None	6 (5%)
Topical	69 (57.5%)
Light therapy	2 (1.7%)
Systemic	21 (17.5%)
Biological	52 (43.3%)
Other	7 (5.8%)
Location [*n* (%)][b]	
No lesions	22 (18.3%)
Scalp	40 (33.3%)
Facial	11 (9.2%)
Auditory	11 (9.2%)
Genital and/or perianal	3 (2.5%)
Hand and/or feet	14 (11.7%)
Nails	9 (7.5%)
Intertriginous areas	6 (5%)
Lower limbs	65 (54.2%)
Upper limbs	65 (54.2%)
Trunk	42 (35%)
Sacral	6 (5%)
NRS[c]	
Itch	2.0 (5.0)
Median and IQR	0–10
Range	0.0 (3.0)
Pain	0–9
Median and IQR	3.0 (6.0)
Range	0–10
Scaling	
Median and IQR	
Range	
Comorbidities [*n* (%)][b]	
None	15 (12.5%)
PsA	
Yes	15 (12.5%)
Unknown	8 (6.7%)
Heart disease[d]	6 (5%)
Overweight	47 (39.2%)
Obesity	30 (25%)
Diabetes	9 (7.5%)
Hypertension	55 (45.8%)
Dyslipidemia	40 (33.3%)
Liver problems	7 (5.8%)
Renal problems	2 (1.7%)
IBD	0 (0%)
Previous malignancy	10 (8.3%)
Malignancy	0 (0%)
Depression suspicion[e]	4 (3.3%)
Depression case[f]	13 (10.8%)
Anxiety suspicion[e]	16 (13.3%)
Anxiety case[f]	15 (12.5%)
Highest obtained degree [*n* (%)]	
Primary	10 (8.3%)
Secondary	61 (50.8%)
Bachelor	26 (21.7%)
Master	22 (18.3%)
Doctoral degree	1 (0.8%)
Work [*n* (%)]	
Unemployed	6 (5.0%)
Retired	18 (15.0%)
Disabled	9 (7.5%)
White-collar	42 (35.0%)
Blue-collar	26 (21.7%)
Self-employed	13 (10.8%)
Other (employed)[g]	6 (5.0%)
Home situation [*n* (%)]	
With partner	39 (32.5%)
With children	4 (3.3%)
With partner and children	46 (38.3%)
With parent	13 (10.8%)
Lives alone	18 (15.0%)
Previous HCP [*n* (%)]	
Coming >1 year to our specialized clinic	57 (47.5%)
GP	13 (10.8%)
Private practice dermatologist	30 (25.0%)
Group practice of dermatologist	3 (2.5%)
Hospital	8 (6.7%)
Other university hospital	6 (5.0%)
None	3 (2.5%)
Need for practical and/or emotional support [*n* (%)]	
No	66 (55.5%)
Yes	
Yes and support received	50 (42%)
Yes and no support received	3 (2.5%)

Abbreviations: GP, General Practitioner; HCP, Health Ccare Professional; IBD, Inflammatory Bowel Diseases; IQR, Interquartile Range; NRS, Numeric Rating Scale; PASI, Psoriasis Area Severity Index; PsA, Psoriatic Arthritis.

[a]PASI missing *n* = 1 as one patient only had inverse psoriasis and thus no PASI could be calculated.

[b]These do not add up to 100% as patients could have belonged to one or more categories.

[c]Missing *n* = 4.

[d]Heart disease includes ischemic heart disease, coronary artery disease and cardiac arrhythmias.

[e]Patients were classified as having a suspicion of depression or an anxiety disorder when they had a HADS subscore between 8 and 10 for either depression or anxiety.

[f]Patients were classified as having a depression or an anxiety disorder when they (1) were previously diagnosed with this disorder, (2) were taking anti-depressants or (3) had a HADS subscore >10 for either depression or anxiety.

[g]Other (employed): includes students.

(Continues)

VBHC's holistic and multidisciplinary approach. In addition, given the current wave of highly expensive innovative targeted drugs for diseases such as psoriasis and atopic dermatitis, there is a clear need for an economically sustainable system. However, VBHC is a concept that is relatively new to the field of dermatology and it has only been sporadically described in dermatologic literature. Considering the growing interest in VBHC development and implementation, it is imperative for dermatologists to become more familiarized with the concept of VBHC. Therefore, this work briefly explains the principles of VBHC and provides current applications, to make it more tangible. Moreover, we put forward a proposal to measure value in psoriasis, which opens up the discussion on applying VBHC in chronic inflammatory skin diseases.

Value

The fundamental and central goal of VBHC is to deliver high value over the full cycle of care.[12] Value in the context of VBHC differs from the standard quality assessments in healthcare, which are often comprised of process indicators and the degree of adherence to guidelines. Value also differs from patient satisfaction and patient experience. Value in VBHC is primarily linked to creating better health outcomes that are relevant to patients. These should be measured in a disease-specific way and should encompass the whole full cycle of care. For each medical condition, these outcomes should be defined within an agreed set of multidimensional outcomes which should be measured in conjunction with costs. However, we rarely measure, let alone openly report on or compare the results we obtain in everyday clinical practice.[12,13] This in turn has slowed innovation and has led to ill-advised cost containment.[12] By measuring value in a systematic and standardized manner for the individual patient, healthcare organizations and providers are able to benchmark their performance, which then drives continuous improvement.[12,13] Moreover, this enables optimization of care by reducing low-value care and waste.

Outcomes

Most VBHC initiatives conducted to date have used either self-developed sets or ICHOM sets to ascertain the value they created, and the latter are specifically developed with the VBHC framework in mind.[22] The documentation of working in a value-based manner in the field of dermatology remains scarce. Core outcome sets for clinical trials have been developed for several chronic inflammatory skin diseases (e.g. atopic dermatitis) or are currently being developed (e.g. psoriasis and hidradenitis suppurativa).[23–25] However, their applicability remains limited for clinical practice. Therefore, development of outcome sets intended for daily clinical practice and that can readily be taken up in routine clinical practice is needed. For psoriasis, previous work regarding a set of psoriasis clinical trials has been done by the International Dermatology Outcome Measures (IDEOM) group.[24] The current work is an extension into defining a value-based set for clinical practice. Indeed, an expected degree of overlap between the outcomes is present, however, this shows potential for harmonization between the two different sets. This harmonization will also allow us to compare the data from clinical trials against the data obtained from clinical practice (real-world clinical evidence). Importantly, this VOS underlines the importance of looking beyond skin symptoms and severity, showing that outcomes such as *confidence in care* and *communication with care professional*, that are easily overlooked in clinical practice, are important from a patient's perspective. As such, this VOS is well suited to capture the relevant outcomes in daily clinical practice. However, routinely assessing patient-reported outcomes (PROs), of which this VOS mainly consists, might pose challenging as regularly collecting PROs in dialysis patients (another chronic disease) yielded low response rates.[26] In addition, completion time was quite long and although the majority of patients was willing to complete the VOS on a regular basis this may not be realistic if done during the practice visit.

We performed a ranking exercise in a large patient cohort to discover the determinants of true value, by assessing the relevance of each outcome, and as such provide a stepping stone towards implementation of VBHC in psoriasis. However, the relevance of each outcome differs between individual patients and as such a personalized approach remains essential. For instance, in our analysis gender had an impact as women ranked the outcomes *intimate relationships* and *productivity* lower than men. In the study of Maul et al., the items of the PBI related to these outcomes were also more important to men, though these differences were not statistically significant.[27] Similarly, they showed that age also affected patients' needs.[27] Patients who previously visited another hospital ranked the outcome *confidence in care* lower, which may reflect the longer treatment trajectory they have been through. Seeing that genital psoriasis significantly affects QoL, one might expect those patients to rank *difficult location clearance* higher.[28] Remarkably, this was not corroborated by our analysis, however, this is likely due to the small sample size of this subpopulation. Finally, the lowest ranked outcomes were related to the cost of care. However, other studies have shown that outcomes related to cost are actually important to patients.[29,30] This discrepancy may be explained by the fact that medical expenses in Belgium are mainly covered and reimbursed by the healthcare system, thereby largely making this outcome irrelevant. Interestingly, we found that certain variables (e.g. comorbidities, need for support, previous HCP) can also have an impact on the importance of outcomes which has thus far only received little attention.

TABLE 3 Outcome ranks and significant predictor variables

	Rank score means (SD)[a]	Gender[b]		Age (per 10 years)		Disease duration (per 10 years)		Systemic treatment		Other treatment		No treatment	
		Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI
Symptom control	15.81 (4.49)	−0.32	−1.26; 0.62	0.15	−0.27; 0.57	**−0.38***	**−0.71; −0.05**	−0.48	−2.09; 1.14	−2.38	−5.14; 0.38	1.30	−0.85; 3.46
Treatment efficacy	13.86 (5.75)	−0.51	−1.45; 0.43	−0.26	−0.70; 0.17	−0.17	−0.52; 0.19	−1.28	−2.88; 0.33	−1.78	−4.77; 1.21	0.72	−1.29; 2.73
Confidence in care	13.48 (5.13)	−0.39	−1.33; 0.56	−0.04	−0.45; 0.37	−0.24	−0.57; 0.10	−0.32	−1.91; 1.27	−0.71	−3.63; 2.21	−1.11	−3.22; 0.99
Control of disease	13.43 (4.82)	−0.61	−1.52; 0.31	−0.12	−0.51; 0.27	−0.21	−0.53; 0.12	**−1.7***	**−3.33; −0.20**	**−3.50***	**−6.49; −0.52**	0.98	−1.01; 2.97
Complete clearance	12.89 (7.11)	0.35	−0.63; 1.33	−0.26	−0.67; 0.16	−0.25	−0.62; 0.12	−0.92	−2.67; 0.83	−2.11	−5.04; 0.82	−0.40	−2.40; 1.59
Treatment sustainability	12.70 (4.91)	−0.48	−1.39; 0.42	−0.35	−0.74; 0.04	0.11	−0.21; 0.43	−1.37	−2.95; 0.20	−0.44	−3.28; 2.41	0.08	−1.87; 2.02
Difficult location clearance	12.32 (5.85)	−0.52	−1.53; 0.49	**−0.51***	**−0.91; −0.10**	−0.19	−0.52; 0.13	−1.35	−2.98; 0.27	−1.02	−3.85; 1.81	−0.53	−2.56; 1.49
Almost complete clearance	11.93 (5.78)	−0.30	−1.23; 0.63	**−0.60****	**−1.01; −0.19**	0.04	−0.30; 0.37	−0.69	−2.24; 0.85	1.00	−2.10; 4.11	−0.26	−2.25; 1.74
Treatment safety	11.83 (5.24)	−0.31	−1.24; 0.61	−0.01	−0.42; 0.39	0.19	−0.15; 0.53	**−1.56***	**−3.06; −0.05**	0.21	−2.51; 2.93	1.22	−0.74; 3.19
Communication with care professional	11.53 (5.72)	−0.26	−1.17; 0.65	0.22	−0.19; 0.62	−0.26	−0.59; 0.07	−0.85	−2.47; 0.78	−1.52	−4.30; 1.25	−1.92	−3.87; 0.03
Daily activity	11.48 (6.24)	−0.71	−1.70; 0.28	**−0.56****	**−0.98; −0.14**	−0.19	−0.53; 0.15	**−2.11***	**−3.82; −0.41**	−0.91	−3.70; 1.87	−0.54	−2.70; 1.62
Emotional well-being	10.98 (6.07)	−0.84	−1.79; 0.11	**−0.49***	**−0.90; −0.09**	0.02	−0.31; 0.35	−1.20	−2.76; 0.37	0.67	−2.16; 3.50	0.10	−2.02; 2.22
Time to clearance	10.68 (5.46)	0.26	−0.65; 1.17	−0.20	−0.61; 0.21	−0.30	−0.63; 0.02	**−1.86***	**−3.44; −0.28**	−1.81	−4.56; 0.94	−0.29	−2.30; 1.72
Treatment tolerability	10.31 (4.97)	0.02	−0.90; 0.95	−0.04	−0.44; 0.37	−0.31	−0.64; 0.03	−0.20	−1.75; 1.35	−0.40	−3.13; 2.34	1.11	−0.88; 3.10
Treatment convenience	10.26 (5.71)	−0.13	−1.07; 0.81	−0.18	−0.58; 0.22	0.06	−0.29; 0.41	−1.18	−2.75; 0.38	−0.26	−2.93; 2.42	**2.33***	**0.29; 4.38**
Intimate relationships	9.56 (5.65)	**−1.91*****	**−2.89; −0.92**	**−0.56****	**−0.97; −0.14**	−0.13	−0.47; 0.21	−1.44	−3.00; 0.13	0.34	−2.53; 3.21	0.58	−1.43; 2.60
Social activity	9.23 (5.84)	−0.97	−1.96; 0.03	**−0.79*****	**−1.22; −0.37**	−0.01	−0.34; 0.33	**−2.73****	**−4.44; −1.02**	0.28	−2.46; 3.02	0.31	−1.79; 2.42
Comorbidity control	8.99 (5.62)	−0.10	−1.03; 0.83	−0.19	−0.57; 0.20	−0.08	−0.40; 0.23	0.36	−1.19; 1.91	1.22	−1.66; 4.10	−0.95	−3.24; 1.34
Productivity	7.95 (5.74)	**−1.49****	**−2.45; −0.53**	**−0.67*****	**−1.07; −0.27**	−0.11	−0.45; 0.22	**−2.21****	**−3.75; −0.66**	**−3.20***	**−6.15; −0.24**	0.70	−1.26; 2.67
Cost of care (patient)	6.28 (5.40)												
Cost of care (societal)	5.49 (4.61)	−0.82	−1.71; 0.07	−0.28	−0.66; 0.09	0.02	−0.30; 0.34	−0.83	−2.35; 0.69	−1.31	−4.01; 1.40	−1.18	−3.10; 0.75
Overall variable *p*-value		**0.001**		**<0.001**		**0.023**		**0.032**		**0.013**		**0.034**	

	Depression		Higher education[b]		Secondary education[b]		Coming >1 year to our specialized clinic[b]		Previously visited other hospital[b]	
	Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI
Symptom control	**2.57*****	**1.24; 3.90**	**1.59***	**0.14; 3.05**	**−1.64***	**−3.00; −0.28**	0.76	0.30; 1.83	**−1.71***	**−3.26; −0.16**
Treatment efficacy	**2.08****	**0.74; 3.42**	**2.67*****	**1.12; 4.21**	**−2.38****	**−3.82; −0.95**	**1.30***	**0.20; 2.40**	−0.80	−2.43; 0.83
Confidence in care	**1.79****	**0.53; 3.05**	1.12	−0.37; 2.61	**−2.36*****	**−3.75; −0.98**	0.02	−1.01; 1.05	**−1.64***	**−3.25; −0.04**
Control of disease	**1.93****	**0.61; 3.25**	1.17	−0.28; 2.61	**−2.21*****	**−3.54; −0.87**	**1.07***	**0.05; 2.09**	−0.59	−2.20; 1.03
Complete clearance	0.62	−0.80; 2.05	0.29	−1.30; 1.88	**−1.69***	**−3.19; −0.18**	0.63	−0.59; 1.84	−1.64	−3.37; 0.09

TABLE 3 (Continued)

	Depression		Higher education[b]		Secondary education[b]		Coming >1 year to our specialized clinic[b]		Previously visited other hospital[b]	
	Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI
Treatment sustainability	1.23	−0.03; 2.49	0.13	−1.37; 1.63	**−1.48***	**−2.85; −0.11**	0.43	−0.60; 1.47	−0.54	−2.06; 0.97
Difficult location clearance	**2.02****	**0.67; 3.36**	0.92	−0.64; 2.49	**−2.49*****	**−3.99; −1.00**	0.58	−0.55; 1.71	0.03	−1.56; 1.62
Almost complete clearance	**1.63***	**0.32; 2.94**	0.91	−0.75; 2.56	**−1.60***	**−3.11; −0.10**	0.27	−0.80; 1.34	**−2.43****	**−3.96; −0.90**
Treatment safety	**1.90****	**0.60; 3.20**	0.53	−0.90; 1.96	**−1.40***	**−2.77; −0.03**	0.43	−0.59; 1.45	−0.72	−2.24; 0.80
Communication with care professional	0.74	−0.54; 2.03	0.99	−0.54; 2.52	**−2.16****	**−3.58; −0.75**	−0.34	−1.37; 0.70	−0.89	−2.34; 0.57
Daily activity	0.75	−0.54; 2.05	**2.20****	**0.68; 3.72**	**−3.35*****	**−4.81; −1.89**	**1.41****	**0.36; 2.46**	0.28	−1.28; 1.83
Emotional well-being	**1.85****	**0.51; 3.19**	**1.57***	**0.10; 3.03**	**−2.87*****	**−4.27; −1.47**	**1.28***	**0.28; 2.28**	−0.43	−1.98; 1.13
Time to clearance	**2.05****	**0.75; 3.34**	1.15	−0.29; 2.60	**−2.41*****	**−3.75; −1.08**	0.37	−0.65; 1.39	**−1.63***	**−3.11; −0.15**
Treatment tolerability	**2.01****	**0.71; 3.32**	1.00	−0.46; 2.45	**−1.41***	**−2.79; −0.04**	**1.06***	**0.00; 2.12**	−0.50	−2.05; 1.06
Treatment convenience	**1.78****	**0.52; 3.04**	0.42	−1.12; 1.95	−1.25	−2.68; 0.19	0.35	−0.78; 1.48	−1.11	−2.66; 0.44
Intimate relationships	**1.86****	**0.55; 3.18**	**2.00****	**0.49; 3.51**	**−3.15*****	**−4.64; −1.67**	0.82	−0.25; 1.89	−0.87	−2.37; 0.64
Social activity	0.65	−0.60; 1.89	**2.02****	**0.51; 3.52**	**−3.21*****	**−4.66; −1.76**	0.76	−0.28; 1.81	−0.03	−1.53; 1.47
Comorbidity control	0.38	−0.91; 1.67	1.13	−0.36; 2.61	**−1.99****	**−3.39; −0.59**	−0.07	−1.11; 0.97	−0.51	−2.04; 1.01
Productivity	0.37	−0.94; 1.69	0.88	−0.68; 2.43	**−2.62*****	**−4.07; −1.16**	0.26	−0.77; 1.29	0.32	−1.22; 1.86
Cost of care (patient)										
Cost of care (societal)	0.83	−0.45; 2.12	−0.19	−1.59; 1.21	−0.72	−2.04; 0.60	0.11	−0.89; 1.12	−0.38	−1.84; 1.09
Overall variable *p*-value	**0.001**		**0.032**		**0.001**		**0.030**		**0.034**	

	Living with parents[b]		Location of facial/scalp		Location of nails		Location of hand/feet	
	Mean	CI	Mean	CI	Mean	CI	Mean	CI
Symptom control	0.97	−0.96; 2.90	−0.78	−1.80; 0.23	−0.43	−2.17; 1.30	−1.26	−2.58; 0.05
Treatment efficacy	1.32	−0.60; 3.24	−0.77	−1.81; 0.26	−1.17	−3.14; 0.79	0.09	−1.26; 1.44
Confidence in care	−0.65	−2.54; 1.24	**−1.10***	**−2.08; −0.11**	0.44	−1.25; 2.14	−0.11	−1.41; 1.18
Control of disease	−0.48	−2.36; 1.40	−0.95	−1.92; 0.01	−1.04	−2.82; 0.73	−0.99	−2.29; 0.31
Complete clearance	0.70	−1.22; 2.62	−0.80	−1.81; 0.22	1.70	−0.12; 3.53	**−1.49***	**−2.85; −0.12**
Treatment sustainability	−0.48	−2.28; 1.31	−0.71	−1.69; 0.27	−0.14	−1.91; 1.62	−0.23	−1.52; 1.07
Difficult location clearance	−1.57	−3.46; 0.31	−0.67	−1.64; 0.29	−0.98	−2.84; 0.88	−0.04	−1.27; 1.20
Almost complete clearance	−1.00	−2.90; 0.91	**−1.00***	**−1.96; −0.05**	−0.08	−1.77; 1.61	−1.12	−2.39; 0.15
Treatment safety	−0.32	−2.19; 1.56	−0.44	−1.40; 0.53	−1.19	−2.93; 0.54	−0.70	−1.96; 0.56
Communication with care professional	1.15	−0.75; 3.04	**−1.14***	**−2.09; −0.18**	−0.81	−2.57; 0.94	−0.07	−1.37; 1.22

TABLE 3 (Continued)

	Living with parents[b]		Location of facial/scalp		Location of nails		Location of hand/feet	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**	**Mean**	**CI**
Daily activity	**−2.00***	**−3.92; −0.08**	**−1.24***	**−2.21; −0.27**	**−2.00***	**−3.72; −0.29**	0.50	−0.79; 1.80
Emotional well-being	−1.64	−3.52; 0.24	−0.55	−1.52; 0.42	−1.05	−2.71; 0.61	−0.90	−2.26; 0.46
Time to clearance	0.49	−1.35; 2.33	−0.32	−1.29; 0.64	1.33	−0.41; 3.06	0.12	−1.20; 1.43
Treatment tolerability	−0.67	−2.50; 1.16	−0.55	−1.52; 0.42	−1.09	−2.77; 0.58	−1.10	−2.35; 0.15
Treatment convenience	−0.64	−2.54; 1.25	−0.38	−1.41; 0.66	−1.44	−3.19; 0.31	0.29	−1.03; 1.60
Intimate relationships	−1.80	−3.77; 0.17	**−1.31****	**−2.28; −0.34**	−1.38	−3.09; 0.32	−1.15	−2.46; 0.17
Social activity	**−2.65****	**−4.59; −0.71**	**−1.25***	**−2.22; −0.28**	−1.65	−3.43; 0.12	−0.26	−1.57; 1.04
Comorbidity control	−1.20	−3.05; 0.66	−0.96	−1.94; 0.01	−1.19	−2.85; 0.47	−1.08	−2.34; 0.18
Productivity	−0.51	−2.41; 1.38	**−1.20***	**−2.17; −0.23**	−0.39	−2.14; 1.36	0.01	−1.32; 1.34
Cost of care (patient)								
Cost of care (societal)	−0.28	−1.99; 1.43	0.58	−0.33; 1.50	−0.59	−2.38; 1.20	0.36	−0.88; 1.59
Overall variable *p*-value	**<0.001**		**0.029**		**<0.001**		**<0.001**	

	Location intertriginous		PASI		NRS pain		Need for support[b]	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**	**Mean**	**CI**
Symptom control	−0.56	−2.51; 1.39	−0.01	−0.14; 0.12	−0.10	−0.30; 0.10	0.38	−1.01; 1.76
Treatment efficacy	−0.67	−2.63; 1.30	0.10	−0.03; 0.23	−0.02	−0.24; 0.19	−0.74	−2.18; 0.70
Confidence in care	−1.89	−3.88; 0.10	0.07	−0.05; 0.19	−0.05	−0.24; 0.15	−0.94	−2.35; 0.47
Control of disease	−1.78	−3.70; 0.15	0.01	−0.11; 0.13	**−0.24***	**−0.45; −0.03**	0.14	−1.22; 1.51
Complete clearance	−0.20	−2.21; 1.80	−0.11	−0.24; 0.02	−0.11	−0.33; 0.12	−1.12	−2.54; 0.31
Treatment sustainability	0.23	−1.86; 2.32	0.06	−0.06; 0.18	−0.18	−0.38; 0.02	−0.18	−1.45; 1.09
Difficult location clearance	0.60	−1.39; 2.60	−0.05	−0.17; 0.07	−0.01	−0.20; 0.18	−0.19	−1.53; 1.14
Almost complete clearance	0.29	−1.66; 2.24	−0.09	−0.21; 0.03	−0.16	−0.36; 0.04	**−1.39***	**−2.71; −0.08**
Treatment safety	−0.41	−2.32; 1.50	0.03	−0.09; 0.15	−0.07	−0.26; 0.13	0.14	−1.13; 1.42
Communication with care professional	**−2.35***	**−4.24; −0.46**	0.11	−0.01; 0.23	−0.12	−0.33; 0.08	−0.51	−1.81; 0.78
Daily activity	0.55	−1.31; 2.42	**0.14***	**0.01; 0.28**	0.10	−0.10; 0.29	0.85	−0.48; 2.18
Emotional well-being	1.41	−0.53; 3.35	−0.00	−0.12; 0.11	0.07	−0.13; 0.27	0.95	−0.35; 2.26
Time to clearance	**−2.12***	**−4.07; −0.18**	−0.04	−0.16; 0.08	−0.14	−0.35; 0.06	−0.56	−1.92; 0.79
Treatment tolerability	−1.88	−3.79; 0.03	0.07	−0.05; 0.19	−0.05	−0.24; 0.14	0.58	−0.72; 1.88
Treatment convenience	−0.23	−2.23; 1.76	0.07	−0.05; 0.19	−0.20	−0.40; 0.00	0.34	−1.00; 1.68
Intimate relationships	0.22	−1.76; 2.20	−0.02	−0.16; 0.11	0.02	−0.18; 0.23	0.67	−0.67; 2.00
Social activity	0.53	−1.43; 2.50	0.00	−0.12; 0.12	0.08	−0.12; 0.28	**1.66***	**0.34; 2.99**

TABLE 3 (Continued)

	Location intertriginous		PASI		NRS pain		Need for support[b]	
	Mean	CI	Mean	CI	Mean	CI	Mean	CI
Comorbidity control	0.24	−1.78; 2.26	0.06	−0.06; 0.18	−0.10	−0.30; 0.10	−1.23	−2.49; 0.04
Productivity	−2.11	−4.39; 0.17	0.02	−0.11; 0.15	**0.22***	**0.00; 0.44**	1.02	−0.26; 2.31
Cost of care (patient)								
Cost of care (societal)	−0.22	−2.07; 1.63	0.02	−0.09; 0.13	0.01	−0.19; 0.20	0.59	−0.62; 1.80
Overall variable *p*-value	**0.001**		**0.013**		**0.003**		**<0.001**	

Note: The highest-ranked outcome received 21 points and the lowest received only 1 point. Mean ranking scores and standard deviations are provided. The Friedman test showed a significant difference between the ranking of the outcomes X^2 (20) = 392.5, $p < 0.001$. The effect of the variables on the ranking of the outcomes is also shown. The effect of a variable on the overall ranking is provided as well as the effect on a particular outcome. Significant results are presented in bold.

Abbreviations: CI, 95% Confidence Interval; NRS, Numeric Rating Scale; PASI, Psoriasis Area Severity Index; SD, Standard Deviation.

[a]Data not normally distributed.

[b]Reference class used.

*$p \leq 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$.

Costs

In VBHC, costs should be looked at over the full cycle of care, including both direct (e.g. service and drug costs) as well as indirect (e.g. facility and administrative costs) costs. The complete cost calculation requires an understanding of all resources used in an individual patient's care. Importantly, cost is the actual expenses for the full patient care, not that what is charged or billed. Time-driven activity-based costing (TD-ABC) is the proposed costing method to measure costs within the VBHC framework.[31] In this method, patient-specific costs are calculated by the time spent for each step in the care process multiplied by the costs per time unit of that resource.[32] Calculating costs using TD-ABC requires mapping of the care process and resource utilization for an individual patient. Time-driven activity-based costing can assist with creating greater cost transparency, allowing one to identify relevant cost drivers, and as such can generate insights for reducing low-value care and costs.[33–35]

Current VBHC applications in chronic inflammatory skin diseases

A full VBHC approach has yet to be introduced within chronic inflammatory skin diseases, however, there are ongoing initiatives that are supportive for applications of VBHC. Care should be delivered using integrated practice units (IPUs) instead of being siloed in specialty departments. In IPUs, care is organized around a patient's medical condition and a dedicated multidisciplinary team provides a broad range of services over the full care cycle for the patient's condition.[6] Examples of IPUs for chronic inflammatory skin diseases include our PsoPlus clinic and the US-based Psoriasis and Psoriatic Arthritis Clinics Multicenter Advancement Network (PPACMAN).[19,20,36] Delivering integrated care using combined dermatology–rheumatology clinics has already shown to improve outcomes as well as patient and physician satisfaction in certain chronic inflammatory skin diseases.[37] Furthermore, healthcare reimbursement systems need to employ alternative payment models (APMs) and move away from fees for individual services. In dermatology, APMs are currently being used and developed throughout the US.[38] Despite these initiatives, to achieve 'value-based dermatology' we need to address all six aspects of the transformation strategy.

Limitations and future directions

Knowing which outcomes to measure is an important first step in the transition to VBHC. This first proposal of a VOS gives HCPs insights on what might matter to their patients and shows how they could start measuring the value they create in daily clinical practice, with the resource setting they apply.

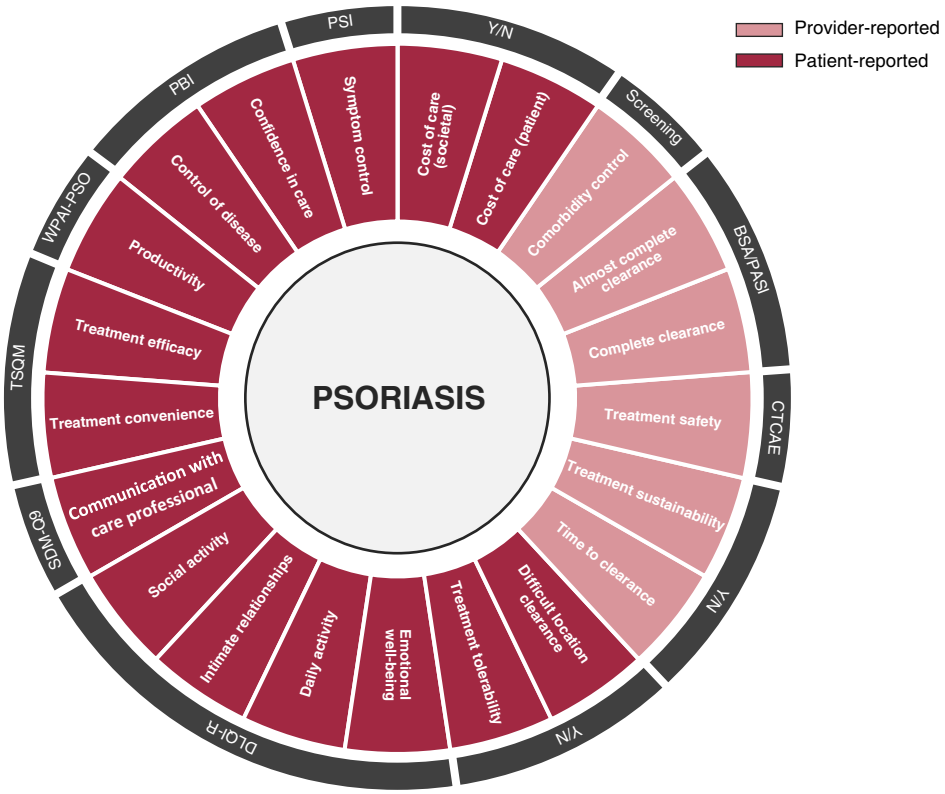

FIGURE 1 Psoriasis value-based outcome set for clinical practice. This value-based outcome set consists of 21 outcomes (inner ring) which are assessed by different instruments (outer ring). Some of these instruments capture multiple outcomes. Outcomes are reported by both the patient and the provider. BSA, Body surface area; CTCAE, Common Terminology Criteria for Adverse Events; DLQI, Dermatology Life Quality Index; PASI, Psoriasis Area Severity Index; PBI, Patient Benefit Index; PSI, Psoriasis Symptom Inventory; SDM-Q9, 9-item Shared Decision-Making Questionnaire; TSQM, Treatment Satisfaction Questionnaire for Medication; WPAI-PSO, Work Productivity and Activity Impairment – Psoriasis; Y/N, Yes/No question

Several limitations need to be addressed. First, as this VOS is currently only defined in collaboration with Belgian patients, international validation is warranted as the relevance of each outcome may vary across countries. Second, this research was conducted in a tertiary setting and as such the surveyed patients may not be representative of the whole population. This would have likely influenced the overall ranking as many patient variables have shown to influence the importance of outcomes. Considering the aforementioned limitations, no decisions were made regarding which outcomes should be seen as primary (i.e. these outcomes should always be assessed irrespective of setting) or secondary outcomes (i.e. optional outcomes, e.g. for use in academic clinics). As a result, the current VOS is possibly too extensive for general daily clinical practice, which is also reflected in the relatively long time needed to complete the whole VOS by patients. The feasibility of HCPs remains to be evaluated. Third, most instruments in this VOS were obtained and selected from guidelines or independent studies as SRs, critically assessing the measurement properties of these instruments in psoriasis, are lacking. In the future, there is need for more robust SRs assessing these measurement properties, which was also endorsed by the IDEOM group.[24] In addition, for some outcomes (e.g. *cost of care*) no suitable questionnaire was found and temporary solutions were provided, however, these lack proper validation. In the next steps, new instruments should be developed to capture certain outcomes more in detail, and these new instruments could possibly also aid in reducing the current overlap between certain instruments. Finally, no patients were involved in selecting the instruments and it is essential that patients will be involved in the future when selecting the final instruments.

Further validation is thus warranted with the research agenda addressing the aforementioned limitations. Research should also focus on how to best incorporate this VOS into psoriasis management. However, as international validation will take considerable time, as seen with the Harmonizing Outcome Measures for Eczema (HOME) initiative, the current VOS can in the meantime inspire HCPs across the globe.[23]

CONCLUSION

This VOS is a first proposal to evaluate psoriasis care in a value-based manner. Measuring these outcomes can enable us to critically appraise and improve current care processes,

within the reality of available resources, thereby increasing value for patients. It opens up the discussion on applying VBHC in chronic inflammatory skin diseases, through the posterchild disease psoriasis, with a first exercise on what outcomes to measure as a reflection of 'value'.

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CONFLICT OF INTEREST

No potential competing interests were reported by the authors.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author.

ROLE OF THE FUNDER/SPONSOR

The funders had no role in the design and conduct of the study; collection, management, analysis and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication. They therefore accept no responsibility for the contents.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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