Diagnosis, classification and assessment

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Abstract:

There have been considerable recent advances in the classification and assessment of Psoriatic Arthritis (PsA). In this report, we give an overview of historic and current classification criteria and discuss its role and limitations in research and clinical practice. We discuss the most commonly used assessment instruments for arthritis, psoriasis, nail onychodystrophy, enthesitis, dactylitis and axial PsA with a focus on clinical practice. We give particular attention to the current evidence for the use of composite outcome measures, and their use in randomised controlled trials and routine care.

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Practice Points:

- The CASPAR criteria are classification criteria. It has variable sensitivity in early Psoriatic Arthritis. Its use as diagnostic criteria may lead to misclassification and a delay in diagnosis.
- The 66/68 Swollen and Tender Joint Count has been endorsed by OMERACT for the assessment of peripheral arthritis in Psoriatic Arthritis. The 28 Swollen and Tender Joint Count lacks content validity.
- There is incongruence between patient and physician assessments of disease activity in Psoriatic Arthritis.
- There is poor correlation between clinical and radiological assessment of enthesitis
- Axial Psoriatic Arthritis may be asymptomatic and inflammatory back pain criteria perform poorly.

Research Agenda:

- Developing and validating classification criteria for axial Psoriatic Arthritis
- Validation and endorsement of a core instrument set for Psoriatic Arthritis
- Agreement on composite outcome measures for use in clinical trials and routine clinical practice

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(A) Diagnosis and classification

The pivotal work of Verna Wright and John Moll advanced the recognition of psoriatic arthritis (PsA) as a distinct clinical entity. In their seminal paper, Moll and Wright synthesized their meticulous observations with existing data, and proposed a de facto case definition for PsA: psoriasis associated with inflammatory arthritis (peripheral arthritis and/or spondylitis) and 'usually' a negative serological test for rheumatoid factor.(1)

This definition was subsequently adopted and adapted as the inclusion criteria for PsA studies. Important nuances described by the authors however, such as a positive rheumatoid factor not being exclusionary, were inconsistently applied. Furthermore, oligoarthritis was not clearly defined. These factors contributed to heterogeneity in findings across PsA research cohorts. Alternative criteria were subsequently proposed, but none were widely adopted (Supplementary Table 1).

The recognition that consensus classification criteria was crucial to generate comparable and reproducible results across PsA cohorts motivated the prospective development of new criteria by the ClASsfication for Psoriatic ARthritis (CASPAR) study group.(2) The resulting CASPAR criteria were generated using international patient-derived data, and encompasses discriminating clinical and radiographic features of PsA (Table 1).(2) The sensitivity and specificity of the CASPAR criteria in its development cohort was 91.4% and 98.7% respectively (Supplementary Table 1).(2) Key advantages of the criteria are that it allows for PsA to be diagnosed despite the presence of a rheumatoid factor and in the absence of psoriasis. Its widespread uptake has been an inflection point in the advancement of PsA research.

There are some limitations to the CASPAR criteria. Firstly, its entry statement is pragmatic and does not define what constitutes inflammatory joint, spinal or entheseal disease. The lack of definition for axial PsA (AxPsA) in particular is in fact a key unmet need. Estimates of axial involvement in PsA vary between 25-70%, depending on how axial disease is defined and assessed.(3) This variability mirrors the heterogeneity seen in PsA phenotyping studies prior to the adoption of the CASPAR criteria, and has significantly fettered research into the natural history and treatment response of AxPsA. Defining AxPsA is a current focus of research and is likely to be complicated by the incongruences between symptomatology, imaging and metrology.(3)

The CASPAR criteria are also fallible in early PsA due to the low prevalence of radiographic damage in early disease and the evolution of phenotype and severity over time (Supplementary Table 1).(4, 5) Consequently, its use as inclusion criteria in randomised controlled trials (RCTs) may disadvantage patients with early PsA and its use as inclusion criteria for longitudinal observational studies (LOS) may bias the study of natural history in early disease. Using a lower qualifying threshold for the CASPAR criteria improves its sensitivity, but at the expense of specificity.(6)

The simplicity and feasibility of the CASPAR criteria lends favourably to its use for diagnosis. However, the criteria have only ever been validated against other criteria and against the clinical judgment of rheumatologists. In practice, repurposing classification criteria as diagnostic criteria can lead to misclassification and diagnostic error, as well as treatment delays with the associated risk of poorer prognosis.(7) The observation made in the first American Rheumatism Association classification criteria remains as relevant today as it did in 1964: “One of the great dangers of an official classification is that it solidifies thinking”.(8) Until the holy grail of a diagnostic biomarker is realised, diagnosing PsA will remain a process that requires rheumatologists to ‘descend into the particulars’. A process

informed by history, examination, serology, inflammatory markers, imaging, the exclusion of mimics, and observation over time.

(A) Assessment

Patients with PsA are variably affected by peripheral arthritis, axial arthritis, enthesitis, dactylitis, psoriasis and psoriatic onychodystrophy. The assessment of PsA therefore involves evaluating disease activity and damage across affected domains, its impact on functional capacity, symptoms, and quality of life, and its associated co-morbidities.

Alongside patient research partners, the Outcome Measures in Rheumatology Clinical Trials (OMERACT) group and the Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) have undertaken a large body of work to develop a core set of domains that should be measured in all RCTs and LOS (Table 2).(9) In order to determine which instruments are used to assess each domain (i.e. the core instrument set), the OMERACT Filter 2.1 Instrument Selection Algorithm process is utilised.(10) This ensures that any instrument endorsed by OMERACT meets the its key pillars of truth (domain match and construct validity), feasibility, and discrimination (reliability, longitudinal construct validity, clinical trial discrimination and thresholds of meaning).

In clinical practice, it is prudent where practicable to utilise validated outcome instruments relevant to the disease manifestations of the patient in order to minimise subjectivity. We will limit our discussion to the most commonly used instruments, highlighting those endorsed for the core instrument set. Radiographic outcomes and co-morbidities are discussed elsewhere.

(B) Domain-Specific Instruments

(C) Peripheral Arthritis

Patterns of peripheral joint involvement in PsA differs from Rheumatoid Arthritis (RA). A significant proportion of patients have large joint oligoarticular disease, and the involvement of the feet and the distal interphalangeal joints (DIPjs) of the hands is common.(4, 11) The 28 tender and swollen joint count (SJC/TJC28) used in RA therefore, lacks content validity. The 66/68 swollen and tender joint count (SJC66/TJC68) is more inclusive and has been endorsed by GRAPPA-OMERACT as a core instrument for peripheral arthritis (Figure 1).(12) The variable reliability in the assessment of joint swelling is well recognised, but this is not unique to the SJC66/TJC68 nor to PsA.(12-14) While the SJC66/TJC68 is slightly time-consuming for routine care, it is necessary given the well-recognised association between persistent joint inflammation and progressive radiographic and clinical damage.(15, 16) The 76/78 swollen and tender joint count may also be used, however it includes the carpometacarpal joints, which are often affected by osteoarthritis, and the DIPjs of the feet, which may affect the instrument's feasibility.(12)

Global assessments of arthritis can also be undertaken using a Physician (PGA) or Patient (PtGA) Global Assessment of arthritis (0-100 visual acuity scale), but the measurement properties of these instruments have not been adequately evaluated. Furthermore, an often-overlooked stipulation of the PGA is that it must be informed by a thorough physical examination of the joints, skin, nails, enthesis and spine. Given physician and patient assessments of disease activity are often incongruous however, it is incumbent on rheumatologists to ensure that patients' perceptions of disease control are also adequately assessed in routine consultations.(17)

(C) Enthesitis

Clinical enthesitis is most often assessed using the Leeds Enthesitis Index.(18) Developed specifically for PsA through data reduction from existing instruments, the LEI includes the bilateral Achilles insertions, medial femoral condyles and lateral epicondyles of the humerus. It is feasible, reliable and includes only entheses that are easy to clinically locate.(14, 18) Some uncertainty remains regarding its floor and ceiling effects, and discriminative capacity. In clinical practice, the main pitfalls are the lack of correlation between clinical and radiological enthesitis and the importance of differentiating enthesitis from co-morbid fibromyalgia.(19)

(C) Dactylitis

Dactylitis is generally assessed using a modification of the Leeds Dactylitis Index (LDI). (20) The 'basic LDI' utilises a circumferometer to measure the circumference of each digit at the base of the phalanx, and requires the application of pressure to the digit (enough to blanch the nailbed of the examiner) to elicit tenderness (0 = no tenderness, 1 = tender). In practice, most clinicians assess dactylitis subjectively, but the reliability of this approach is inferior.(21)

(C) Axial

The assessment of AxPsA has been extrapolated from Ankylosing Spondylitis (AS), despite the differences in symptomatology, genetics, radiography, and prognosis.(3) The evaluation of activity typically involves the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) and Ankylosing Spondylitis Disease Activity Score (ASDAS), however these have only been validated in patients who also meet the modified New York Criteria for AS.(22, 23) Both instruments incorporate the assessment of peripheral joint pain and swelling as well as a general question regarding morning stiffness, and therefore may lack the ability to discriminate between axial and peripheral activity.(24) The Bath Ankylosing Spondylitis

Functional Index (BASFI), is subject to similar limitations. The assessment of metrology typically employs the Bath Ankylosing Spondylitis Metrology Index (BASMI), which has been associated with radiographic outcome measures in 'AxPsA'.(25) The utility of all instruments remains uncertain while AxPsA remains undefined.

In clinical practice, it is important to be aware that patients with imaging axial involvement may be not have inflammatory back pain, and may indeed be asymptomatic.(3) Imaging these patients is not reasonable to clarify the phenotype of the patient, however the natural history of such patients and the role of therapeutics in asymptomatic axial disease is unclear.

(C) Psoriasis and Psoriatic Onychodystrophy

The instruments most commonly used to assess psoriasis and features of psoriatic nail disease are summarised in Table 2. Additionally, patient-reported outcome measures such as the Psoriasis Symptom Inventory and the Dermatology Quality of Life Index (DLQI) may be used. In practice, the Physician and Patient Global Assessment of Psoriasis and the Patient and Physician Nail Visual Acuity Scales (VAS) are attractive from a feasibility perspective. For inexperienced raters or in patients with significant skin or nail involvement, a more quantitative approach may be preferable to optimise reliability.

(C) Patient-reported outcome measures for fatigue, pain, quality of life and function

The Functional Assessment of Chronic Illness Therapy-Fatigue (FACIT-F) is a generic instrument that has been formally assessed in PsA and is used to assess fatigue in RCTs and observational studies.(26) Pain is typically assessed using a VAS or a numeric rating scale (NRS). QoL is most commonly assessed using a generic instrument such as the 36-Item Short Form Survey (SF-36) or a disease-specific instrument such as the Psoriatic Arthritis Impact of Disease 12-Item Questionnaire (PsAID-12). The former allows for comparisons across

diseases and with historical cohorts, while the PsAID-12 has been extensively validated and endorsed by OMERACT as a core instrument in the assessment of QoL in PsA.(27) Physical function has been typically assessed using the physical component of the SF-36 (SF-36 PCS) and the Health Assessment Questionnaire – Disability Index (HAQ-DI). Both instruments have the ability to discriminate in clinical trials, and the latter has an established minimal clinically important difference in PsA.(28, 29)

(B) Composite Measures of Disease Activity

PsA is now well recognised to be a destructive arthropathy. Approximately 50% of patients develop erosive disease within two years of diagnosis and damage accumulates in established disease. (30-32) Equally PsA may only affect a small number of joints (mono or oligoarthritis) or follow a milder course with little inflammation or damage, yet PsA has a similar impact on physical function and QoL as RA. The impact on function and QoL despite milder joint disease is due in large part to the cumulative impact of the other domains of disease such as psoriasis, enthesitis, dactylitis and axial disease.(33) Focusing on joint disease alone therefore underestimates the total burden of disease.

To address this concern there has been an international effort to devise composite measures that more accurately capture the total burden of disease by assessing more domains. Broadly speaking these measures can be considered in two categories: response criteria that define a disease state such as low disease activity (LDA) or remission, and continuous composite measures that offer a scale of disease activity. The components, scale and thresholds for each composite measure we discuss are included in Table 4.

(C) Response Criteria

The primary endpoint of RCTs is often still the American College of Rheumatology response criteria (ACR 20/50/70) representing 20, 50 or 70% improvement in joint count, physician global, patient global, patient pain, Health Assessment Questionnaire (HAQ) and C-Reactive Protein (CRP) or erythrocyte sedimentation rate (ESR). The ACR criteria were developed for use in RA and modified for PsA with the SJC66/TJC68, however there is increasing recognition that this target was not built for purpose and only captures articular disease.

The Psoriatic Arthritis Response Criteria (PSARC) were developed for a trial of sulfasalazine and adopted for use in PsA.(34) It has been endorsed by the some regulatory agencies, including the European Medicines Agency, and it is the threshold for defining treatment response to biologic and targeted synthetic disease modifying anti-rheumatic drugs (b/tsDMARDS) as defined by the National Institute for Health Excellence (NICE) in the United Kingdom, however it is infrequently reported in clinical trials as other instruments (such as the ACR) are more discriminatory.

The Minimal Disease Activity (MDA) criteria were developed to address this concern and includes: physician assessment of joints, skin and enthesitis, and patient-reported pain, physical function and global disease activity.(35) The MDA was used as the treatment target in the Tight Control of Psoriatic Arthritis (TICOPA) trial, the first treatment strategy trial in PsA which demonstrated tight control improved clinical and patient-reported outcomes.(36) MDA is a state of LDA rather than remission, and as such is an achievable target for clinical practice. Furthermore, the MDA has been utilised in numerous RCTs and observational datasets where it has discriminated between treatment groups and is associated with improved physical function, QoL and less radiographic damage.(37) The MDA is now frequently reported in RCTs.

(C) Continuous composite measures

The main disadvantage of response criteria is that they do not capture changes in disease activity along a scale. Therefore efforts have been made to develop continuous measures with validated cut-offs for remission, low, moderate and high disease activity. The Composite Psoriatic Arthritis Disease Activity Index (CPDAI) was developed to capture the original OMERACT core domains (Table 4). (38) The CPDAI is a comprehensive measure with defined thresholds, but has not been widely adopted in part because it is not felt to be feasible in clinical practice and because outcomes important to patients such as pain and fatigue are not well represented. (39)

The GRACE measure (initially named the Arithmetic Mean of Desirability Function- AMDF) and Psoriatic Arthritis Disease Activity Score (PASDAS) are continuous measures that capture multiple domains of disease (Table 4). (40) The PASDAS has consistently been shown to be the best performing composite measure in clinical trials but has not yet been widely adopted in routine clinical practice due to feasibility. (39)

The Disease Activity in Psoriatic Arthritis (DAPSA) was developed from a measure of Reactive Arthritis and is a measure of articular disease comprised of a joint count, patient global and pain scores, and CRP.(41) The DAPSA has validated thresholds for low, moderate and high disease activity and has been evaluated in numerous datasets.(42) The main advantages of the DAPSA are its simplicity, ease to calculate and focus on a single disease domain that will not be confounded by fluctuation of other disease domains.

(C) Short composites for clinical practice

It has been recognised that wider uptake composite measures in routine clinical practice are limited by feasibility. It is often simply too time consuming to perform and collate all the clinical and patient-reported components in a short clinic appointment. At the 2019 GRAPPA annual meeting, members recognised that many of the existing measures (CPDAI, PASDAS and DAPSA) were not feasible in routine practice and voted for testing of abbreviated measures (43). Work is underway to test the performance of shortened versions that may be more feasible. The following is an overview of four existing short composite measures for use in clinical practice.

The Routine Assessment of Patient Index Data 3 (RAPID3) was developed for use in RA and is a 0-30 scale derived from the sum of mHAQ, patient global and patient pain divided by three. The RAPID3 has been tested in RCT and observational datasets and correlates well with the PASDAS and DAPSA.(44) The RAPID3 was able to distinguish between treatment arms in the TICOPA trial, correlated closely with PASDAS and showed superior discrimination to the DAPSA.(44) The RAPID 3 is not disease-specific and therefore allows comparisons across diseases and its feasibility is appealing to a practicing clinician. Despite evidence for good performance characteristics in PsA, the absence of a physician component or representation of other PsA specific domains may limit further adoption.

The 3 Visual analogue scale (3VAS) was proposed from the GRACE study and is comprised of a physician global VAS (informed by a thorough examination), patient global and patient skin visual analogue scores (VAS).(40) The 3VAS performs well in terms of reliability, responsiveness and discrimination compared to the PASDAS when tested in GRACE, and more recently in another observational study (ASSESS – author's unpublished data), but has not been adopted widely due to concerns that clinicians may not conduct thorough examinations in the time-pressured clinical environment unless components such as a joint

count or skin score are mandated. Nevertheless, its feasibility and inclusion of patient-specific outcomes lends favourably to its use in clinical practice.

The disease activity score for RA (DAS28) has also been proposed as a short composite for use in PsA.(45) The DAS28 includes a 28-joint tender and swollen count, patient global VAS and either an ESR or CRP. The score is calculated using weighting of the components. Whilst the DAS28 is familiar to us and feasible in practice, there are significant concerns that a 28-joint count may miss a significant burden of joint disease and fails to capture other domains of disease; it is listed herein for completeness but is not proposed as a candidate for use in PsA.(46)

The clinical DAPSA (cDAPSA) has been proposed as a more feasible measure for routine practice. The score is identical to the original DAPSA but does not include the laboratory assessment for CRP. 70.2% of the GRAPPA membership voted as a feasible measure for routine practice.(39)

(C) Strengths and limitations of composite measures

All the composite measures address the concern of underestimated burden of PsA to varying degrees by including multiple outcomes or domains of disease. The patient global VAS if administered correctly could potentially encapsulate all the ways in which an individual is affected by PsA. Incorporating both patient and physician outcomes affords composites increased face validity by addresses the well-recognised disconnect between physician and patient assessment of disease. This likely results in a truer reflection of disease state. The further addition of a laboratory marker in some composite measures adds an objective measure of disease, however a validated serum soluble marker of inflammation in PsA remains elusive

and the added value of existing markers like CRP and ESR remains uncertain. Finally, continuous composite measures allow for tracking of disease activity over time and the evaluation of disease activity against target thresholds such as remission and low disease activity.

Limitations of composites should also be recognised. None truly encompass all the ways in which an individual can be affected by PsA and therefore disease burden may still be underestimated; for example, the DAPSA focuses solely on articular disease, the PASDAS does not include a skin measure, and the MDA does not include axial disease. Secondly, all the composites require the assessment and collation of multiple outcomes which is time consuming, and some of the instruments require computation, which further impacts feasibility. In addition, multiple outcomes in a single measure mean that composite measures are disproportionality affected by missing data. Finally, it is recognised that different disease domains can flare then remit independently therefore is it easy to imagine that a score could remain unchanged despite a flare of joints and remission of skin disease.

(A) Summary

There have been considerable advances in recent years in the classification and assessment of PsA, with the validation of the CASPAR criteria serving as an important milestone in PsA research. The lack of a definition or classification criteria for AxPsA has impeded the study of its natural history and treatment responses, and is a priority for the research agenda. The development of a core outcome set for the assessment of PsA in RCTs and LOS is imperative in order to facilitate collaboration, and the interpretation of data within and between studies. There are a wealth of single domain and composite instruments available, but the measurement

properties of these instruments need further evaluation, and additional research required to fill necessary knowledge gaps prior to pursuing consensus on a core outcome set.(47)

Table 1: CASPAR Criteria

ClASsification Criteria for Psoriatic Arthritis
Patient must have inflammatory articular disease (joint, spine, or entheseal) with 3 points from the following 5 categories: (1) Evidence of current psoriasis, a personal history of psoriasis, or a family history of psoriasis. - Current psoriasis is defined as psoriatic skin or scalp disease present today as judged by a rheumatologist or dermatologist (Score = 2) - A personal history of psoriasis is defined as a history of psoriasis that may be obtained from a patient, family physician, dermatologist, rheumatologist, or other qualified health care provider (Score = 1) - A family history of psoriasis is defined as a history of psoriasis in a first- or second-degree relative according to patient report (Score = 1) (2) Typical psoriatic nail dystrophy including onycholysis, pitting, and hyperkeratosis observed on current physical examination. (Score = 1) (3) A negative test result for the presence of rheumatoid factor by any method except latex but preferably by enzyme-linked immunosorbent assay or nephelometry, according to the local laboratory reference range. (Score = 1) (4) Either current dactylitis, defined as swelling of an entire digit, or a history of dactylitis recorded by a rheumatologist. (Score = 1) (5) Radiographic evidence of juxtaarticular new bone formation, appearing as ill-defined ossification near joint margins (but excluding osteophyte formation) on plain radiographs of the hand or foot. (Score = 1)

Table 2: Core Domain Set for Psoriatic Arthritis (9)

Domains to be measured in all RCTs	Domains that are strongly recommended but not mandatory for all RCTs and LOS	Domains that may be important but need further study
Musculoskeletal disease activity	Economic cost	Independence
Skin disease activity	Emotional well-being	Sleep
Pain	Participation	Stiffness
Patient global function	Structural Damage *	Treatment burden
Physical function		
Health-related quality of life		
Fatigue		
Systemic inflammation		
* Evidence for inhibition of structural damage should be required at least once during the development programme of a new medication but not required in all RCTs and LOS		

Figure 1: Variations of the swollen and tender joint counts

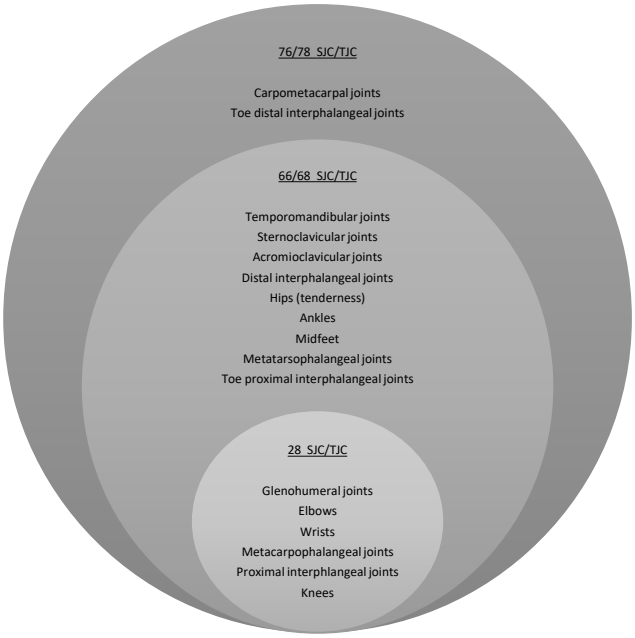

Table 3: Physician-administered instruments used for the assessment of Psoriasis and Psoriatic Nail Disease

Instrument	Factors assessed	Scoring	Range	Modifications	
Cutaneous Psoriasis					
Psoriasis Area and Severity Index (PASI)	Scale (S) Erythema [E] Induration [I] Body surface area (BSA)	[S], [E], [I] assessed individually for each of the 4 assessed regions (head, arms, trunk, legs). Scored on a standardised scale of 0-4 and summed together in each region i.e. HEAD = [S] + [E] + [I] ARMS = [S] + [E] + [I] TRUNK = [S] + [E] + [I] LEGS = [S] + [E] + [I] Area score calculated in 4 regions with a score of 0-6 per region. Estimated involvement within each region calculated using 2 assumptions (1) One palm assumed to represent 1% of total BSA. (2) Head assumed to represent 10% of total BSA, Arms 20% BSA, Trunk 30% BSA, Legs 40% BSA. 0 = Region not affected 1 = <10% of region affected 2 = 10-29% of region affected 3 = 30-40% of region affected 4 = 50-69% of region affected 5 = 70=89% of region affected 6 = 90-100% of region affected E.g.. If psoriasis affects an area of skin the size of 2 palms on the elbows, this would mean that 20% of the arms are affected = Arms area score 2 Score weighted: Head = 0.1, Arms = 0.2, Trunk = 0.3, Legs = 0.4 I.e. PASI = {HEAD x Head area score x 0.1) + (ARMS x Arms area score = 0.2) + (TRUNK x Trunk area score = 0.3) + (LEGS x Legs area score x 0.4)	0-72	PASI50 (50% improvement in PASI) PASI75 PASI90 PASI100 Validated self-administered version (SAPASI)	Widely used in trials - able to placebo arms. Good intra and 50) Moderate-Goo PGAskinxBSA Sensitive to ch PASI75 correl RCTs (0.92 at
Body Surface Area (BSA)	Body surface area	One palm assumed to represent 1% of total BSA.	0-100	BSA <3% PGASkin X BSA	Widely used in trials - able to placebo arms. Good intra and (ICC>0.75) (4 Moderate-Stro Psoriasis Symp Quick - Good
Physician Global Assessment	Qualitative assessment of severity	Various versions available where 0 = clear Highest score = severe	0-4 0-5 0-6	PGASkin X BSA	Widely used in trials - able to placebo arms.

Skin (PGASkin)					Good intra- an Moderate-Stro (48-50) PASI75 correl 8-16 weeks) (5
PGASkin x BSA	Qualitative assessment of severity	Product of PGASkin x BSA		PSAxBSA50/75/90	Moderate corr Strong correla assessment of Sensitive to ch PSAxBSA50/ PASI50/75/90 PSAXBSA75 PASI75(52)
Psoriatic Nail Dystrophy					
Nail Psoriasis Severity Index (NAPSI)	**Nail Matrix:** Pitting Leuconychia Crumbling Red spots **Nail Bed:** Onycholysis Oil drop dyschromia Subungal hyperkeratosis Splinter haemorrhages	Fingernail divided into quadrants Nail matrix manifestation - Scored 1 if any present in each nail Nail Bed manifestation - Scored 1 if any present in each nail	0-80	Hands and Feet (Score 0-160) NAPSI75 (75% improvement in NAPSI) Target NAPSI	Widely used in difference betw Moderate-Goo with training. Moderate corr assessment an Psoriatic Arthr
Modified Nail Psoriasis Severity Index (mNAPSI)	**Nail Matrix:** Pitting Leuconychia Crumbling Red spots **Nail Bed:**	**Pitting: Scored based on number of pits** 0: No pits 1: 1-10 pits 2: 11-49 pits 3: ≥50 pits **Onycholysis or Oil drop dyschromia: Scored based on area involved** 0: No involvement 1: ≤10% involvement 2: 11-30% involvement 3: >30% involvement **Crumbling: Scored based on area involved** 0: No crumbling 1: 1-25% involvement	0-130	Target mNAPSI	Widely used in to detect differ arms. Excellent inter Moderate corr (59, 61) Strong correla change in SNA

	Onycholysis OR Oil drop dyschromia Subungal hyperkeratosis Splinter haemorrhages	2: 26-50% involvement 3: >50% involvement **Scored 1 for each if present, 0 if absent:** Leuconychia, Red spots, Subungal hyperkeratosis, Splinter haemorrhages			
Physician Nail Visual Acuity Scale (PhNVAS)	Qualitative assessment of severity		0-100		Quick. Used in able to detect placebo arms. Moderate-Exc Moderate corr SNAPS (59, 6
Severity of Nail Psoriasis Score (SNAPS)*	Onycholysis Pitting Subungal hyperkeratosis Significant nail involvement	Also referred to as the PNSS (Psoriasis nail severity score). Each feature scored 0 if absent and 1 if present in each fingernail Imagining a longitudinal midline, significant nail involvement is defined as involvement across the midline.	0-40	Hands and Feet (Score 0-80)	Time to score: Excellent inter Strong correla Moderate corr Sensitive to ch Strong correla change in mN PhNVAS not s

Table 4: Composite measures in Psoriatic Arthritis- components and disease activity thresholds

RESPONSE CRITERIA		
	Components	Thresholds
MDA and VLDA(35)	68 tender joint count ≤1 66 swollen joint count ≤1 enthesitis count ≤1 PASI ≤1 or body surface area	MDA- Achieving 5 of 7 VDA- Achieving 7 of 7

	Patient global visual analogue scale ≤20 mm, patient pain visual analogue scale ≤15 mm HAQ ≤0.5	
ACR 20/50/70(62)	68/66 joint count tender and swollen joint counts plus three of the following: physician global patient global patient pain function (HAQ) CRP/ESR	Achieving Improvement of 20%/50%/70%
PSARC(34)	68/66 joint count tender and swollen joint counts physician global (likert scale) patient global (likert scale)	Achieve 2 of the following 4 (with no worsening of any component): Improvement of at least 30% in tender *or* swollen joint count improvement of at least 1 point in physician *or* patient global (on a 5-point Likert scale)
CONTINUOUS COMPOSITE MEASURES		
DAPSA(41, 42)	Sum of the following:	Continuous scale

	68/66 Joint Count Patient Global 0-10 Patient Pain 0-10 CRP	Remission <4 LDA ≥4 ≤14 MDA >14 ≤28 HAD >28
PASDAS(63)	Weighted index comprising: 68/66 Joint Count SF36 PCS Quality of life (QOL), Patient and Physician by Visual Analogue Scale (VAS) CRP,	Scale 0-10 Near Remission <1.9 LDA ≥ 1.9 <3.2 MDA ≥3.2 <5.4 HDA ≥ 5.4
GRACE(40)	GRACE= (1- the mean of the 8 variables) x10 Joints: 66/68 joint count Skin (PASI) PsAQoL Patient joint VAS Patient skin VAS Global HAQ	Scale 0-10)
CPDAI(38)	*Joints* Joints 68/66 joint count and HAQ	Scale 0-15

	skin PASI & DLQI *Enthesitis* LEI and HAQ *Dactylitis* Dactylitis count and HAQ *Spine* BASDAI and ASQoL	Remission <2 LDA ≥2 <4 MDA ≥4 <7 HDA ≥7
SHORT COMPOSITES FOR CLINICAL PRACTICE		
RAPID3(64)	mHAQ 0-10 Patient Pain 0-10 Patient global 0-10	Scale 0-30 Remission ≤3 LDA 3.1–6.0 MDA 6.1–12.0 HDA >12 Developed in RA, tested in PsA
3VAS(63)	Sum of three VAS scales divided by 30 Physician Global VAS Patient Global VAS	Scale 0-10

	Patient Skin VAS	
Clinical DAPSA (cDAPSA)	Sum of the following: 68/66 joint count patient global 0-10 patient Pain 0-10	Scale 0-154 Remission <3 LDA ≥3 ≤13 MDA >13 ≤27 HDA >27
DAS 28 (45)	Weighted index 28-joint tender and swollen counts, patient global VAS score and ESR or CRP	Scale 0-10

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