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GRAPPA-OMERACT consensus-based recommendations and research agenda for use of composite measures and treatment targets in PsA

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Background: Many composite disease activity measures and targets have been developed for psoriatic arthritis (PsA). This GRAPPA-OMERACT work stream aimed to further the development of consensus among physicians and patients.

Methods: Prior to the meeting, physicians and patients were surveyed on outcome measures. A consensus meeting (26 rheumatologists, dermatologists, and patient representatives) reviewed evidence on composite measures and potential treatment targets, plus survey results. After discussions, participants voted on proposals for use and consensus was established in a second survey.

Results:

Survey results from 128 HCPS and 139 patients were analysed alongside a SLR summarising evidence. A weighted vote was cast for composite measures (for RCTs, most popular measures were PASDAS [40 votes] and GRACE [28 votes]; for clinical practice, most popular were 3-VAS [45 votes], DAPSA [26 votes]). After discussion there was no consensus on a composite measure. The group agreed that several composite measures could be used. Future studies should allow further validation and comparison.

The group unanimously agreed that remission should be the ideal target with minimal/low disease activity a feasible alternative. The target should include assessment of musculoskeletal disease, skin and health related quality of life. The group recommended a target of treatment as VLDA, or MDA.

Conclusions: Consensus was not reached on a continuous measure of disease activity. In the interim the group recommends several composites. Consensus was reached on a treatment target of

VLDA/MDA. An extensive research agenda was composed and recommends that data on all PsA clinical domains be collected in ongoing studies.

Introduction

In 2016, a new core outcome set for psoriatic arthritis (PsA) was developed by the Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) group and endorsed by the Outcome Measures in Rheumatology Clinical Trials (OMERACT) conference(1). This was the result of a two year programme of work to establish the key domains for randomised controlled trials (RCTs) and observational studies in PsA. Following acceptance of this core outcome set, the GRAPPA/OMERACT group is developing the complementary core outcome measurement set which will recommend outcome measures to assess these domains in PsA.

Different groups have been established to examine groups of outcome measures including patient reported outcomes, musculoskeletal disease activity, skin disease activity, systemic inflammation, imaging, economic cost and composite disease activity measures. Composite disease activity measures most commonly focus on disease activity and are frequently used in RCTs and increasingly in routine practice to assess outcomes of therapy in PsA and other inflammatory arthritides. Whilst, by definition, composite measures include multiple components, they can vary significantly in terms of the domains addressed and methods used to combine them into a composite score.

Nearly all composite disease activity measures combine patient reported outcomes (eg pain, patient global) with physician assessed outcomes (eg joint counts, body surface area of psoriasis). Historically, the composite measures used for PsA have been developed in other diseases, most commonly rheumatoid arthritis, and focus specifically on peripheral arthritis as a single domain. More recently newer composites have been developed specifically for PsA which have combined outcome measures in multiple domains (eg peripheral arthritis, skin psoriasis, enthesitis) into a single composite to reflect all of the ways a patient may be affected by their psoriatic disease activity.

The objective of this work was to use multiple methodologies to review composite measures and potential treatment targets in PsA establishing recommendations and developing a research agenda

for future work. This paper reports the output of a consensus meeting, with discussions focusing on the systematic literature review data and pre and post meeting surveys of patients and physicians held in 2017.

Methods

Prior to the consensus meeting, two surveys were conducted. One survey was sent to health care professional (HCP) members of GRAPPA to establish current practice internationally with regard to composite measures and targets. A second survey was sent to patients with PsA to establish their experience, what assessments they feel are important and how they wish to be involved. Patients were recruited internationally including several GRAPPA patient research partners (PRPs), members of patient support groups and patients recruited from routine clinics.

As part of the GRAPPA-OMERACT initiative, a systematic literature review (SLR) of composite disease activity measures was undertaken, alongside other groups reviewing patient reported outcomes, clinical disease activity measures, laboratory and imaging measures. The first part of this initiative was a systematic literature review to identify all composite measures tested in PsA and to assess their validity in this disease. Using data identified and summarised for the SLR, evidence sheets for the composite measures and potential targets were developed for the consensus meeting attendees. Two different versions were created, one for physicians and one for PRPs. These summarised the level of evidence for the measures using the OMERACT filter(2).

On 10th February 2017, a one day consensus meeting was held. The meeting had an independent chairperson (AMK) and consisted of plenary presentations, breakout groups, group discussion and voting. International experts including members of GRAPPA and OMERACT were invited to the consensus meeting, including the developers of all of the measures discussed. Both rheumatologists and dermatologists were invited to ensure that both musculoskeletal and skin manifestations of PsA

were considered, and four PRPs from GRAPPA were invited to ensure representation of the patient perspective. At the meeting, key data including results of the pre-meeting surveys were presented.

The morning session of the consensus day was focused on composite measures of disease activity in PsA. The composite measures discussed were PsA disease activity score (PASDAS)(3), GRAPPA composite index (GRACE)(3), composite psoriatic disease activity index (CPDAI)(4), disease activity in PsA (DAPSA)(5), routine assessment of patient index data 3 (RAPID3)(6) and 3 visual analogue scales (VAS) scores (3-VAS: patient global, patient skin and physician global).

The afternoon session focused on treating to target and potential targets available in PsA. These included cut points of these composite measures where available but focussed specifically on DAPSA remission/low disease activity(7), the minimal disease activity (MDA) criteria(8) and more stringent very low disease activity (VLDA)(9) as these two measures had accumulated the most validation data. The domains included in these composite measures are shown in Table 1.

For both sessions, after presentation of the key data for the outcome measures, breakout groups with representatives from rheumatology, dermatology and PRPs were established to discuss the pros and cons for each measure. These groups then reported back to the complete attendee group. There was then discussion and debate on the different measures with voting on recommendations.

Results

Composite disease activity measures

Physician survey – A total of 128 health care professionals responded, the majority (82%) rheumatologists. The domains of disease most commonly assessed in clinical practice were joints (97%), dactylitic digits (88%), entheses (87%), pain (86%), CRP/ESR (86%) and skin (84%). When asking specifically about composite measures, 45% of HCPs reported that they regularly use a composite measure in their practice, most commonly the minimal disease activity (MDA) or the routine assessment of patient index data (RAPID3). The majority of respondents thought that a

single composite measure was more clinically useful than individual assessment of each domain, and they felt that such composites should include measures of arthritis, enthesitis, dactylitis, inflammatory markers and patient global scores. The failure to recommend inclusion of a psoriasis assessment is related to the low number of dermatology respondents. The dermatologists chose skin measures as their top items but included the same measures as the rheumatologists (highlighted above) as their subsequent choices.

Patient survey – A total of 139 patients responded. Most reported that they see their physician every 6 months for assessment, and the majority (84%) reported that their physician assessed only painful or problematic joints rather than a formal joint count. Less than a quarter of patients are asked to complete any questionnaires at or prior to their appointment although 91% would be willing to do so if asked. The most important domains of disease highlighted by the patients were pain (46%), joints (36%) and physical function.

Discussion on measures

Breakout groups were then convened to discuss the following measures: PASDAS, GRACE, CPDAI, DAPSA and the RAPID3 and 3-VAS scores. The pros and cons of these measures highlighted by the breakout groups and subsequent discussions are shown in Table 2. With the exception of DAPSA, the measures are composites covering multiple domains of PsA including peripheral arthritis, skin, dactylitis, enthesitis, axial disease, C-reactive protein (CRP), function and health related quality of life (HRQoL). However no composite measure includes all of these. Therefore for each measure, it is important to know which domains may not be fully assessed. Some felt that measures of individual domains (eg DAPSA for peripheral arthritis) were optimal as disease activity could be quantified separately in each domain. Any asynchronous flare in one domain (eg skin flare) would not impact the measurement of a potential improvement in joints. The differential response of psoriatic disease domains may complicate interpretation of composite measures, as seen in the PRESTA trial

where MSK outcomes were similar on two different doses of etanercept but a psoriasis dose response to treatment was observed(10). These data show that the inclusion of skin disease in a composite psoriatic disease measure identifies a treatment effect in psoriatic disease as a whole despite no differential effect on MSK activity. Some felt that composites covering multiple domains were optimal to quantify the overall burden of disease activity for each patient but clarified that these should then be reported with their individual components to assess each domain as well as total scores.

There was much discussion concerning the outcome measures in general but in particular about whether it is appropriate to include measures of physical function or HRQoL in a disease activity index. These items may be considered measures of impact, influenced by cumulative damage as well as activity. Whilst not ideal to have different measures, the varying feasibility for daily clinical practice and clinical trials was also discussed.

The GRACE was felt to be a valuable composite but inclusion of the psoriasis area and severity index (PASI) was felt to be impractical for clinical usage. Ideally the measure of skin disease should be feasible for non-dermatologists. Adaptation of the GRACE measure with a simpler skin tool to replace the PASI may help but this would require further validation.

RAPID3 is a commonly used generic measure of disease activity, particularly used in practice in the US. Whilst the SLR showed preliminary validation in PsA, it was developed for RA and is focused on peripheral joint disease. A modification with a psoriasis VAS (RAPID3Ps) has also been tested which may be more helpful in patients with significant skin disease.

The 3VAS score was initially developed from the GRACE project but has not been widely published. It consists of an average of 3 VAS: patient skin, patient global and physician global. This is quick and feasible but does not include any objective inflammation measures. Whilst this is similar in feasibility to RAPID3, the inclusion of a physician global (which would indirectly require a physician's examination) could be a benefit. However there is little validation of this measure to date. For both

RAPID3 and 3VAS there was discussion about the potentially significant impact of comorbid fibromyalgia which may disproportionately affect these composites.

DAPSA is specifically a measure of peripheral arthritis without any inclusion of other domains. Several attendees commented that this was a good measure of peripheral arthritis, but separate assessment of skin disease and potentially other domains should be mandated alongside DAPSA to ensure a full assessment of PsA disease activity.

Following the discussion, all attendees (rheumatologists, dermatologists and patient research partners) voted on the optimal composite scores for RCTs and clinical practice. Each participant had up to five votes for the best measure for use in trials and up to five votes for the best measure in clinical practice. These could be assigned to one measure, or distributed across them. The outcome of the vote was spread across measures, with no single measure receiving a strong vote in favour for use in both settings (Figure 1). For use in RCTs, PASDAS received the highest number of votes (n=40) followed by GRACE (n=28) and CPDAI (n=25) whilst for clinical practice, 3VAS received the highest number of votes (n=45) followed by DAPSA (n=26) and CPDAI (n=23). A number of items were identified for the research agenda.

At the end of this session, it was agreed that any measure can be used, as long as the patient's disease is fully assessed and patient-reported outcomes are included in the evaluation. It is important to look at how existing composite measures could be modified for future use.

Potential treatment targets

Physician survey – The majority of HCPs (57%) believe that remission should be the optimal target of treatment with an alternative of low or minimal disease activity. The most important factors that would influence HCPs when setting the treatment target include co-morbidities (81%), disease activity (79%) and patient goals (65%). At present, 56% of HCPs report that they do treat-to-target in

clinical practice and the three most popular targets utilised are MDA (32%), followed by DAS28 low disease activity (LDA) (10%) and DAS28 remission (9.5%). Assessment of joints, health related quality of life, and skin and nails, were most frequently mentioned as domains to include for a treat to target approach.

Patient survey – Again the majority of patients (56%) agree that remission or alternatively MDA/LDA should be the treatment target and most patients (45%) defined 'remission' as the absence of disease or symptoms. However the majority (61%) report that they have not discussed personal goals for managing their PsA with their rheumatologist and nearly 1 in 5 patients want their rheumatologist to listen to their concerns more.

Discussion on targets

The first discussion was the conceptual target of treatment. The only treat to target study in PsA used MDA as the target (11), a measure of low disease activity rather than remission. Despite this, the treatment arm had a higher rate of adverse events so it was discussed that the risks and benefits should be evaluated in each individual patient case. In line with previous EULAR treatment recommendations (12) and the 2017 treat to target taskforce recommendations (13), the group unanimously agreed that remission should be the treatment target, but in certain circumstances, LDA/MDA is a reasonable alternative.

Breakout groups were then convened to discuss the following targets: VLDA, MDA, modifications of MDA where some items are mandated and DAPSA remission/low disease activity. The pros and cons of these measures highlighted by the breakout groups and subsequent discussions are shown in Table 3.

Given the nature of the disease, the majority of attendees felt that for face validity, any measure of remission or low disease activity should assess multiple domains of disease, particularly peripheral

arthritis and skin as these are the most prevalent domains. Whilst rheumatologists tend to prioritise joints over skin when treating their patients with PsA, skin disease is highly important and impactful to patients, with residual skin disease being associated with a poorer function and quality of life(14). When considering concepts such as remission the whole patient should be assessed.

DAPSA can be used both as a measure of disease activity and a target. However DAPSA is designed to measure peripheral arthritis with even the patient global VAS score asking about joint disease. In some RCTs of biologics the levels of active skin disease and enthesitis of those in DAPSA remission are similar to VLDA(15). However in studies of patients with significant baseline skin disease and recent real life clinic datasets, research has shown that patients in DAPSA remission can have significant levels of active skin disease with associated impact on HRQoL which goes against the face validity of such a measure as defining remission of psoriatic disease (16-19). A potential solution would be to require physicians to assess multiple targets for individual measures such as peripheral arthritis and skin disease. However there is a concern that physicians may not perform all assessments and therefore active disease would be missed. Research on DAPSA also showed higher levels of residual disease activity than in VLDA/MDA possibly due to the nature of DAPSA as a summary score where one element can be high if the others are low(16-19).

MDA/VLDA is a measure of disease state, not a measure of disease activity therefore if MDA is recommended as the target, a different composite of disease activity would still be required. MDA and VLDA do not include a measure of acute phase reactants allowing calculation before blood results are known. However it is recommended that acute phase reactants should be tested in addition to the clinical criteria aiming for normalisation in a chronic inflammatory disease(13). The design of MDA is modular with each item assessed individually but as only 5 of the 7 criteria must be met for MDA, residual disease can occur in one domain, particularly skin as only one item measures skin disease directly. This is not the case with VLDA (where all cutpoints must be met) or modifications that require the skin and/or joint items to be met. Concern was raised about the

inclusion of health assessment questionnaire (HAQ) as one of the items in MDA/VLDA. This could potentially prevent patients from achieving VLDA despite adequate control of inflammatory disease activity due to accumulated damage. However in this case, the patient would achieve MDA as the alternative target.

Following on from these discussions on the use of targets in PsA, attendees first voted on the domains that should be considered in a target. The group unanimously agreed that when assessing a target of treatment, there should ideally be assessment of musculoskeletal disease, skin disease, and disease impact/HRQoL.

There was agreement that both MDA and DAPSA had advantages and disadvantages and more research should be done. However, in the absence of data, it was agreed that the rheumatology community needs guidance on what to use now to encourage a treat-to-target approach. This was observed with DAS28 in RA, which was initially not liked but is now widely accepted. Therefore a motion was proposed that "the group at present recommends a target of treatment as VLDA (remission), or MDA 5/7 as an alternative low/MDA". This was not unanimously supported, there were 21 votes in favour, 2 against and 1 abstention.

Post meeting survey

Physician survey – A total of 115 HCPs responded to the second survey, the majority (77%) rheumatologists. Most supported the development of composites but agreed with the advantages and disadvantages listed. Overall the RAPID3 and 3VAS were felt to be quick and feasible but not comprehensive enough with no objective measures included. DAPSA was feasible but only included assessment of peripheral arthritis and was felt to be more appropriate for polyarticular disease. GRACE, PASDAS and CPDAI were felt to be comprehensive but less feasible for routine practice. The balance between inclusion of key domains but without being time consuming was felt to be key. Less than 10 minutes, or ideally less than 5 minutes was felt to be reasonable for clinical practice.

CPDAI was the highest ranked (6.4/10) for use in clinical practice but all scores were ranked between 4.5 and 6.5. For RCTs, CPDAI, PASDAS and GRACE were felt to be the most appropriate scoring 6.7, 6.4 and 6.6 out of 10, with the rest less popular. The vast majority (93%) supported the decision from the meeting that all measures should be studied further and data should be collected to allow comparison.

The specific issue of the inclusion of HAQ in some measures was also addressed. The majority felt that HAQ could (48%) or should (13%) be included in composites. Most recognised that HAQ could be influenced by domains other than disease activity but that "whilst it is affected by damage, even in established disease it frequently shows change and can be useful to measure".

The majority of HCPs (92%) supported the recommendation that the conceptual target should be remission or alternatively MDA/LDA. Some highlighted that there is not yet evidence for additional benefits of remission over MDA and that there may be a risk of increased treatment burden. 92% support the fact that the target should include MSK and skin disease, and 90% support the inclusion of HRQoL as well. For the target to be used, 90% supported the recommendation of VLDA and/or MDA as the treatment target.

Patient survey – A total of 64 patients responded the post-meeting survey. The majority (72%) supported the recommendation that the target should encompass MSK disease, skin disease and HRQoL. They also specifically mentioned fatigue, enthesitis and physical function as key domains. The vast majority (90%) supported the concept of remission or alternatively LDA as a target and the recommendation for the use of VLDA/MDA (77%).

Research Agenda

Throughout the meeting, items for the research agenda were identified and noted. Whilst a significant amount of data is available for the composites following recent research, as identified by

the SLR, there is still a lot to understand about these measures. Many composite measures were developed without substantial patient involvement and this should be addressed in future research. Recent research has highlighted that concomitant fibromyalgia impacts on all disease outcome measures and this must be considered. For specific measures a variety of validation data is missing. In particular, there has been very little analysis on the 3VAS measure and this needs a lot more validation. For some of the composite measures, additional data is particularly required on the validity of the cut points as potential targets such as those for PASDAS and CPDAI.

A number of research agenda items related to less well studied domains including axial disease, fatigue and nail disease. Whilst many measures include a patient global, there is a wide variety of the wordings used in these composites which would benefit from further analysis and standardisation. There were also a number of potential modifications that were suggested for the existing composites. For the multi-domain measures the majority of modifications were related to simplification (eg BSA or PGA x BSA substituted for PASI) or substitution of HRQoL or physical function measures. For DAPSA, there was interest in studying DAPSA alongside a skin measure, particularly when considering it as a target. Particularly for potential targets, additional data directly comparing measures, and their concordance/discordance will be valuable to understand them further.

Summary

Within the OMERACT framework for developing a core outcome measurement set for PsA(2), a consensus meeting is reported which established current practice using physician and patient surveys, discussed current SLRs to establish evidence, debated the advantages and disadvantages of the different measures and made recommendations on the use of composite measures and clinical targets. While a single composite measure was not chosen, a research agenda was established to aid in this. For targets, there was agreement on the conceptual definition of the target (remission or

alternatively low/minimal disease activity), domains that should be considered (MSK, skin and HRQoL) and a proposed target of VLDA or MDA for current practice.

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Table 1: Domains included in the composite measures discussed

	PtGA	Pain	PhysGA	Joint	Skin	Enthesitis	Dactylitis	Spine	HRQoL	HAQ	CRP
PASDAS	√		√	√		√	√		√		√
GRACE	√	√		√	√				√	√	
CPDAI				√	√	√	√	√	√	√	
DAPSA	√	√		√							√
3VAS	√		√		√						
RAPID3	√	√								√	
MDA/VLDA	√	√		√	√	√				√	

3VAS – 3 visual analogue scores, CPDAI – composite psoriatic disease activity index, DAPSA – disease activity in PsA, GRACE – GRAPPA composite score, MDA – minimal disease activity, PASDAS – PsA disease activity score, RAPID3 – routine assessment of patient index data 3, VLDA – very low disease activity

Table 2: Advantages and disadvantages of composite disease activity measures from breakout and discussions.

Measures	Advantages	Disadvantages
DAPSA	• Captures arthritis specifically (different drugs act on different aspects of PsA disease) • Can be used with or without CRP • Continuous measure • States response • Responsiveness • Relatively simple measure; easy application in practice • Feasibility (calculation and conduct) • Validated cut-points • Uses 66/68 joint count	• No skin/dactylitis/ enthesitis/nails/fatigue • Does not capture totality of psoriatic disease ('PRO') • Fatigue (depression) • FMS influence • Arthritis global rather than true global VAS • Face validity lacking as other domains of PsA not assessed • Composite of articular disease only
PASDAS	• Comprehensive • Captures many dimensions of the disease • Responsive • Patient perspective • PGA/ PtGA includes skin • Can give individual scores • Includes enthesitis/dactylitis	• Not transparent • Needs computer to calculate • Not currently used much • No specific skin measure • No specific axial component • Fatigue*/pain* are not captured

	• Good cut-off validity • Escapes from RA paradigm • PsA specific	• No specific participations* or functions; functions as outcome measures is old and outdated • No reliability data • SF-36 has disadvantages (not disease-specific, cost, etc.) *Important outcomes for patients
3VAS	• No blood test required • Patient-centric • Simple, speedy and feasible • Includes skin disease • Potential to add nail disease • Physician global (but mandates a joint count) • Fits into PASDAS • Potential to add pain to global assessment, following definition	• Too easy to manipulate • Dangerous for decision making • No APRs • Effect of patient global/patient pain – not disease activity • Not specific to enthesitis or axial disease • No objective measures • No mandated joint count
RAPID3	• Includes pain • Can be modified to measure skin using RAPID3Ps • Very quick and feasible • Only generic disease measure	• Includes HAQ which may reflect damage as well as activity • May be forced to pay for use • No objective measures

		• Includes patient measures but no physician global assessments
GRACE	• PsA specific • Has face validity • Feasible • Patient-reported with additional measures of joint counts • Has components from clinical trials (joint count, PASI) • Feasible to translate into clinical practice	• No APRs • Includes HAQ • Includes PASI, which has limitations • Not as feasible for clinical practice
CPDAI	• Skin included and other relevant domains • Modular and adaptable to reflect changes in disease assessment • Computerised version (MOPsA) • Captures differential response • Intuitive; makes sense • Does not involve blood tests • Preserves mild/moderate/severe disease	• No pain/fatigue/patient global/APRs • Cut-offs for skin disease • Does not assess nail disease • Time consuming, so difficult to do in clinic but MOPsA helps (can complete in 6 minutes)

3VAS – 3 visual analogue scores, CPDAI – composite psoriatic disease activity index, DAPSA – disease activity in PsA, GRACE – GRAPPA composite score, PASDAS – PsA disease activity score, RAPID3 – routine assessment of patient index data 3

Table 3: Advantages and disadvantages of PsA target measures from breakout and discussions.

Measures	Advantages	Disadvantages
MDA/VLDA	• Feasible in practice • Simple to perform (no calculations) • Derived from patient data • Includes global assessment and pain • Strong evidence with treat-to-target TICOPA • Responsive to change, correlates to damage, sustains over time • Correlates with patient opinion (PsAID) • Modular so no items can score too highly • MDA matches well with PASS & PsAID PASS • Includes joints/skin/enthesitis/PROs • Does not require CRP for calculation	• HAQ may prevent VLDA • Dermatology threshold could be lower in line with dermatologist recs (BSA ≤1%) • Heterogeneous in terms of response • Binary, not a continuous activity measure • MDA can have some active skin and joint disease activity • Possibility of overtreatment as VLDA may be difficult to achieve • Nails not included • No specific measure of axial disease • Add impact to target, e.g. PsAID • Does not include CRP, so should be done separately
MDA modifications	• Emphasises skin and/or joints domains	• Includes HAQ (Concern over whether this may reflect

	• MDA composite forces domain look • Target not a measure • Avoids active skin disease if this domain is required (otherwise it can be missed despite MDA)	damage not activity, could not be removed/replaced without further research) • Consider others (i.e. PFI-10, SF-36, PsAID, PsAQoL) • Dermatology threshold could be lower in line with dermatologist recs (BSA ≤1%) • Does not include PROs for skin
DAPSA remission/LDA	• Feasible in practice • Simple to perform (easy calculation) • Includes global assessment and pain • Exclusion of HAQ is regarded by some as a positive • Responsive to change • Correlates to damage, states disease activity, sustains over time • Not Boolean restricted	• Misses skin and nails • Does not measure axial disease or enthesitis • Exclusion of HAQ is regarded by some as a negative • No data on patient opinion of remission/LDA

	• Psoriatic disease vs PsA vs skin disease • Includes CRP

BSA – body surface area, DAPSA – disease activity in PsA, HAQ – health assessment questionnaire, LDA – low disease activity, MDA – minimal disease activity, PASS – patient acceptable symptom state, PRO – patient reported outcome, PsAID – PsA impact of disease score, TICOPA – tight control of psoriatic arthritis study, VLDA – very low disease activity

Table 4: Research Agenda

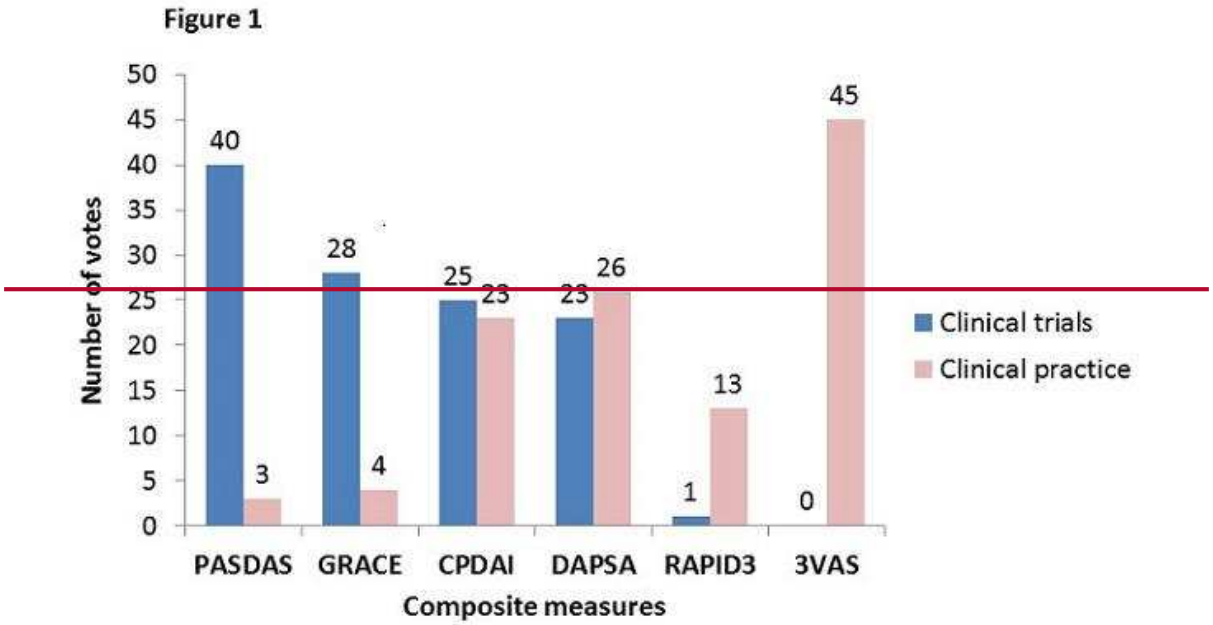
Additonal validation data	• 3VAS • CPDAI • GRACE • PASDAS • CPDAI and/or PASDAS as a target
General	• What treat-to-target information measures do trials or regulatory companies (such as the FDA) need, as these may need to be included in composite measures • Is it possible to use only the spine-related questions from the BASDAI questionnaire • Fatigue to be assessed in clinical practice, as it is not currently assessed as a single domain in any composite measure • How nail assessment be added or captured in existing measures • How to deal with fibromyalgia as it affects all of these tools
Importance of skin disease	• If residual skin disease is allowed within a target, how does this impact on the patient? • In different populations how do standard MDA and modifications requiring skin/joints compare? • Validation of more feasible proxies for PASI such as PGA x BSA
Potential modifications	CPDAI • Can CPDAI be adapted to include other modules • Can DAPSA be used for the joint portion • SPARCC to LEI conversion • Nails

	• What if you use the spine measures and not BASDAI • Should PASI be substituted with BSA • Could this be simplified • Could other modules for CPDAI be added eg life impact DAPSA • The PCA cohort did not include patients with more severe skin disease – repeat PCA in a cohort with more skin disease • Does skin pain factor into the pain VAS • Should global be expanded to include skin and arthritis • What would a target that includes DAPSA + skin, or DAPSA + skin and nails assessment look like and how would it behave psychometrically GRACE • Can GRACE be adapted to include BSA • Can PsAQoL be substituted with PsAID in GRACE RAPID3 • Can HAQ be substituted with a skin assessment in RAPID3 MDA • Switch out HAQ for PSAID or other PROs • Add impact/PSAID • Add nails, or nail VAS • BSA target 1% (though 3% acceptable) - should this be changed for VLDA
Global assessment	• Does the PtGA capture the correct domains • What happens when the definitions of PtGA are changed in different measures

	• Retrospective analysis of different approaches to carrying out global assessments
HAQ	• How are composite scores affected when HAQ is excluded ○ How does this changes the psychometric properties of the other outcomes • If physical outcomes are necessary to include in composite measures, is HAQ the most appropriate measure • Can a new outcome measure for physical function be used instead of HAQ • Can HAQ be substituted with PsAID • Can HAQ be excluded from MDA, and what difference does this make
Comparing remission	• What prevents a person from getting to MDA/VLDA • What prevents a person from achieving DAPSA remission/LDA • Among the DAPSA remission group, what is preventing someone from getting VLDA?

3VAS – 3 visual analogue scores, BASDAI – Bath ankylosing spondylitis disease activity index, BSA – body surface area, CPDAI – composite psoriatic disease activity index, DAPSA – disease activity in PsA, GRACE – GRAPPA composite score, HAQ – health assessment questionnaire, LEI – Leeds enthesitis index, MDA – minimal disease activity, PASDAS – PsA disease activity score, PASI – psoriasis area and severity index, PCA – principle component analysis, PGA – physician global assessment, PRO – patient reported outcome, PsAID – PsA impact of disease, PsAQoL – PsA quality of life, PtGA – patient global assessment, RAPID3 – routine assessment of patient index data 3, SPARCC – spondyloarthritis research consortium of Canada, VAS – visual analogue score, VLDA – very low disease activity

Figure 1: Outcome of a weighted vote for outcome measures in clinical practice and clinical trials



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