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Supplementary Material 1. Radiologist Feedback

	Radiologist 1	Radiologist 2	Radiologist 3	Radiologist 4	Radiologist 5
Q1: Do you feel that ‘joint erosions’ is an important target domain for a radiographic outcome instrument used in the above setting?	Yes	Yes	Yes	Yes	Yes Comment: I believe erosion (of which I would consider osteolysis to be simply an extreme) is the most important feature, as it is this phenotype that is at risk of arthritis mutilans.
Q2: Do you agree with the working definition for ‘joint erosions’?	No Comment: it must 100% clear that the definition refers to erosion of bone. Many structures have a cortex and some have a lining, but 'cortical lining' is a phrase I have never come across before and it seems very confusing to me. The cortex of the bone is a 'lining' of the bone, not the joint. In addition, it would be more usual to word a definition in the singular rather than the plural as singular erosion does occur and we are talking about a	Uncertain. Comment: A single plane is not enough to diagnose erosion and	Yes	Yes. Comment: May want to define which joints/ carpal bones to be accessed	Uncertain. Comment: "Articular bone erosions" would be preferable to "joint erosions," but the latter can be used if further qualifications are added. For example, fractures are also “breaches of the cortical lining,” and can occur on articular surfaces and complicate steroid treatment, etc., so I think the definition should be

	<p>concept. Further, breaches can occur in the cortex normally - so all erosions are breaches but not all breaches are erosions. Therefore, I would have thought the definition should be: "Joint erosion is an abnormal breach in the cortex of the bone that forms part of a joint."</p>	<p>may lead to over/under reading</p>			<p>more specific. The intended pathological finding is cortical destruction caused by inflammation not trauma or material insufficiency. Those alternatives could be cited as exclusions, e.g., "joint erosions are breaches in the cortical lining of articular bones not related to traumatic or insufficiency fracture" or simply "...are breaches in the cortical lining of articular bones not related to fracture." The definition could also include "focal" as a qualifier, but doing so may imply exclusion of osteolysis or extensive erosion consuming the entire articular surface, as in pencil-in-cup and licked candy stick deformities often seen in advanced PsA. I believe the underlying process for all of these findings is the same – inflammatory bone erosion (the verb) – so the actual distinction among them is one of extent, and that can be captured in the scale used. To summarize, I recommend "joint erosions are breaches in the cortical lining of articular bones not related to fracture."</p>
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Q3: Do you feel that ‘joint space narrowing’ is an important target domain for a radiographic instrument in the above setting?	Yes	Yes	Yes	Yes	Yes
Q4: Do you agree with the working definition for ‘joint space narrowing’?	Yes	Uncertain Comment: Need of additional plane	Yes	Yes Comment: Again, may want to have specific bones/joints to be evaluated particularly in the carpus	No Comment: I would add “...as a measure of articular cartilage loss.” Changes in joint-space width can occur also because of changes in joint positioning, loadbearing, ligamentous laxity, joint effusion or synovial thickening. Given this nonspecificity, it would be good to indicate the specific structure that JSN is intended to reference.
Q5: Do you feel there are any other domains that MUST be included as ‘target domains’ in a radiographic outcome instrument used for the assessment of	No	Yes Comment: Periostitis	Yes Comment: Subchondral osteolysis	Uncertain	No

<p>peripheral structural damage in PsA RCTs despite any potential impact on feasibility?</p>					
<p>Q6: Do you feel there are any other domains that SHOULD be included as ‘exploratory domains’ as part of the Psoriatic Arthritis structural damage research agenda (i.e. measured in addition to a radiographic outcome instrument used in the above setting)?</p>	<p>Uncertain. Comment: I don’t know if the proliferative component of PsA may have important prognostic significance and could be measured</p>	<p>Yes Comment: Ankylosis and Osteolysis</p>	<p>Yes: Comment: Periostitis, Ankylosis, Subluxation</p>	<p>Uncertain. Comment: May want to assess for new bone formation, but will be difficult to score these changes</p>	<p>Yes Comment: Proliferative changes are of questionable clinical relevance, aside from ankylosis and Bone enlargement/deformity, which can interfere with joint mechanics. Ankylosis is captured in mSvDHS as grade 4, but equated in this scale with dislocation. Both conditions render the joint nonfunctional, but it may be useful to distinguish these, as the pathophysiological process underlying them differ, and some interventions may work better on one than the other, or indeed worsen one more than the other. Bone enlargement/deformity is another manifestation of proliferative change in PsA that may be a relevant treatment target and therefore useful to develop methods for evaluating.</p>

<p>Q7: Is the proposed image orientation clearly-worded and appropriate?</p>	<p>Yes</p>	<p>Yes</p>	<p>Yes</p>	<p>Yes</p>	<p>No</p> <p>Comment: In the operational definitions of erosions and JSN, “single plane” should be changed to “single projection” as plain radiography is a projectional not tomographic technique. For Orientation, I recommend: “PA radiographs of each hand and wrist including the distal radial metaphysis. Anterior-posterior radiographs of each foot, including all toes and MTP joints”</p>
<p>Q8: Is the proposed joint positioning clearly-worded and appropriate for radiographs of the Hands and Wrists?</p>	<p>Yes</p>	<p>Yes</p>	<p>Yes</p> <p>Comment: Suggestion to add this: The x-ray beam passes through the hand from</p>	<p>Uncertain</p> <p>Comment: May want to include pictures of the positioning. Possibly</p>	<p>No</p> <p>Comment: I recommend changing the last sentence to "The fingers should be straightened if possible and adducted together." This positioning is more reproducible and takes up less monitor space (important when viewing multiple visits side-by-side) than does positioning with fingers separated. Separating the fingers does not substantially improve</p>

			dorsal to palmar	consider a hand/wrist template to make it more reproducible over different timepoints	alignment of the joints; in fact, it more often distorts them, especially at MCP 2 and MCP5.
Q9: Is the proposed joint positioning clearly-worded and appropriate for radiographs of the Feet?	Uncertain. Comment: Inclusive of at least 2 inches of the tibia may not be feasible in some cases with ankle pain that have limited ankle extension.	Yes	Yes	Yes	No Comment: I recommend: "Patient is supine or sitting on imaging table with knee flexed and aligned with the ankle, and the foot plantar surface down and flat on the positioning template on a cassette. The long axis of the foot should be parallel to the midline of the receptor. The toes should be straight and not extended upwards. Sand bags or tape can be used to help with this." Extended toes are common on X-rays of the feet, and can completely obscure the MTP joint spaces, so this is an important element of the technique to emphasize.
Q10: Are the proposed image acquisition parameters appropriate for: Exposure	Yes	Yes	Yes	No Comment: Consider 50kVp at 1.6mAs for	Yes

				hands as exposure is too high for Hand/Wrist; may be high for feet as well	
Q11: Are the proposed image acquisition parameters appropriate for: Film focus distance	Yes	Yes	Yes Comment: Can be up to 105cm	Yes	Yes
Q12: Are the proposed image acquisition parameters appropriate for: Resolution	Yes	Yes	Yes	Yes	Yes

<p>Q13: Are the proposed image acquisition parameters appropriate for: Beam-centering</p>	<p>Uncertain.</p> <p>Comments: For the feet, the beam ankle should be 'towards the heel' or 'towards the hindfoot' rather than 'towards the head'</p>	<p>Yes</p>	<p>Yes</p>	<p>Yes</p>	<p>No</p> <p>Comment: I recommend: "Hand/wrist: 3rd metacarpal joint, perpendicular to the surface of the receptor. Foot: Between the 2nd and 3rd metatarsophalangeal joints, perpendicular to the surface of the receptor." Angling the beam in the foot is used to visualize the joints of the forefoot, but compromises projection of the MTP joints, which are the primary focus in PsA. A perpendicular beam projects the MTP joints optimally. It is how we have done all of our arthritis trials for the past 25 years. Also for Other Instructions, I recommend changing the first sentence to "Ensure adequate visualisation of all joints spaces where feasible."</p>
<p>Q14: Review the sources of score variability. Are there any redundant items?</p>	<p>No</p>	<p>No</p>	<p>No</p>	<p>No</p>	<p>No</p>

<p>Q15: Please review the sources of score variability identified. Would you suggest including any other items?</p>	<p>Yes.</p> <p>Comments: Viewing conditions. For example, is the observer using 'medical grade' monitors? They have approximately 100 times the grey-scale definition of even the highest grade commercial monitor for watching movies etc. Those monitors are designed for optimal spatial resolution, colour resolution, and temporal resolution but have limited grey-scale resolution.</p>	<p>No</p>	<p>Yes.</p> <p>Comments: Unavailability of representative images of definitions and grade of joint items included in structural domain</p>	<p>Yes.</p> <p>Comments: Amputation, Joint fusion</p>	<p>Yes</p> <p>Comment: I recommend changing Patient Factors to "Contribution of concurrent structural damage caused by prior trauma, surgery or another arthropathy such as osteoarthritis. Presence of joint prosthesis or other metallic hardware. Patient positioning. Variability in spectrum of disease."</p>
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Supplementary Material 2. Domain Definition

Working group: Psoriatic Arthritis Structural Damage
Target Population: Adults aged 18 years and older with peripheral Psoriatic Arthritis
Intended Use: Randomised Controlled Trials
Intervention: Disease-modifying anti-rheumatic drug
Control: Placebo or Active Comparator

	Domain Perspective
Core Area	Manifestations/Abnormalities
Broad Domain	Structural Damage
Target Domain	Joint Erosions

	Joint Space Narrowing
Working Definition of target domain	<p>Joint erosion is an abnormal breach in the cortex of the bone that forms part of a joint and is unrelated to a fracture</p> <p>Joint space narrowing is a reduction in the space between articulating surfaces of a joint</p>
Domain Components	<p>Joint erosion is an abnormal breach in the cortex of the bone that forms part of a joint and is unrelated to a fracture, visualised in a single projection on plain radiography.</p> <p>Joint space narrowing is any reduction in the space between articulating surfaces of a joint visualised in a single projection on plain radiography.</p> <p>Image Orientation:</p> <p>Posterior-anterior radiographs of each hand and wrist including the distal radial metaphysis</p>

Anterior-posterior radiographs of each foot, including all the toes and metatarsophalangeal joints

Suggested Joint Positioning:

Hands and Wrists

Individual is seated next to the imaging table

Elbow flexed at 90 degrees and level with the shoulder

The second metacarpal should be in line with the radius

The wrist and hand should be placed flat and palms down on a positioning template on a cassette/receptor

The fingers should be straightened if possible and adducted

Feet

Individual is supine or sitting on the imaging table with knee flexed and aligned with the ankle

The foot should be placed plantar surface down on the positioning template on a cassette

The long axis of the foot should be parallel to the midline of the receptor

The toes should be straight and not extended upwards. Sand bags or tape can be used to assist

Suggested Image Acquisition:

Exposure: 60 kVp and 3mAs

Film Focus Distance: 100-105cm

Resolution: Digital resolution of 100 microns (0.10x0.10mm) preferred (87 – 175 microns acceptable)

Beam centering:

Hand/wrist: 3rd metacarpal joint, perpendicular to the surface of the receptor

Foot: Between the 2nd and 3rd metatarsophalangeal joints, perpendicular to the surface of the receptor

Other Instructions:

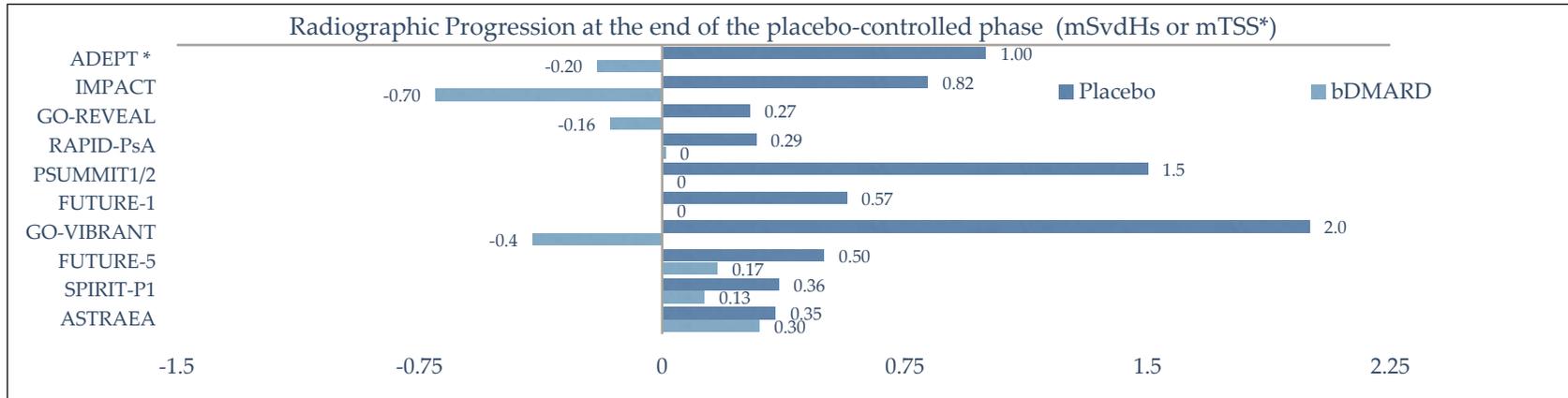
Standardised positioning template for joints and pictures demonstrating patient positioning

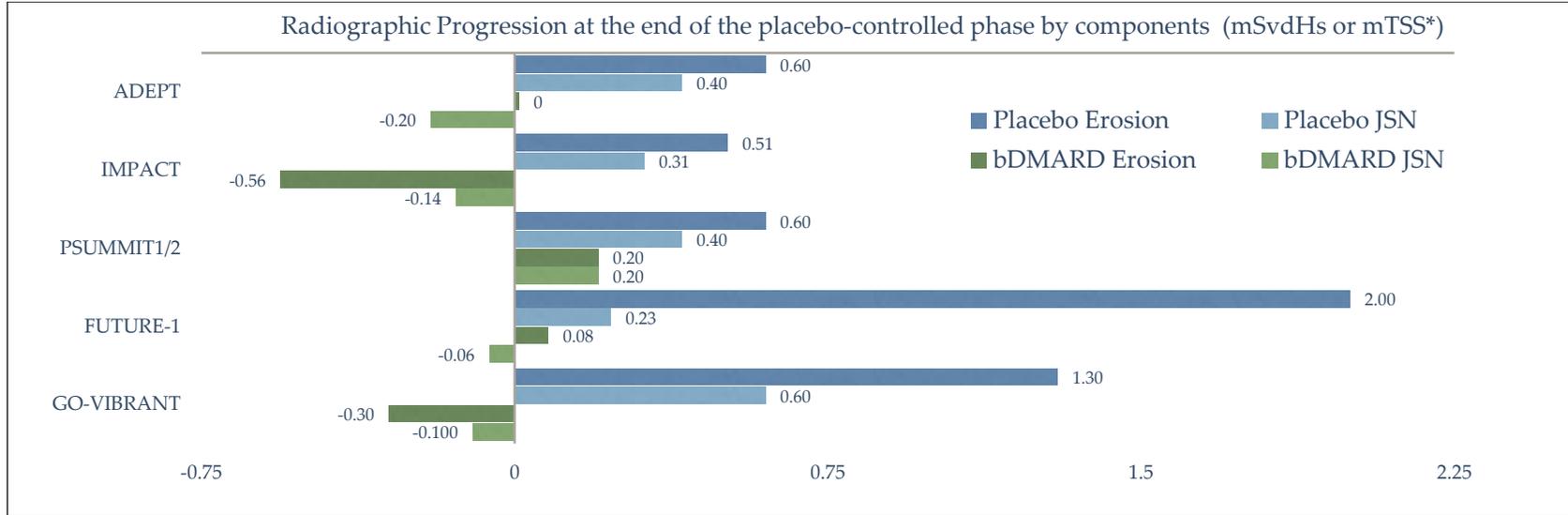
	<p>Use of medical-grade monitors</p> <p>Ensure adequate visualisation of all joints where feasible</p> <p>Ensure no artefacts</p> <p>Ensure the use of left and right markers</p> <p>Ensure removal of all jewellery</p> <p>Ensure removal of tight socks</p>
<p>Qualitative Literature to support</p>	<p>[1] Orbai A-M, et al. Ann Rheum Dis 2017;76:673–680. doi:10.1136/annrheumdis-2016-210242</p> <p>[2] Taylor et al. Operational definitions and observer reliability of the plain radiographic features of Psoriatic Arthritis. J Rheum 2003; 30(12):2645-58.</p> <p>[3] Jadon et al. Psoriatic Arthritis Mutilans: Characteristics and Natural Radiographic History. J Rheum (2015); 42(7): 1169-76</p>
<p>Sources of score variability:</p>	<p>Theoretical and operational definitions</p> <p>Patient factors including Contribution of concurrent structural damage caused by prior trauma, surgery or another arthropathy such as osteoarthritis Presence of joint prosthesis, amputation, joint fusion, or other metallic hardware Patient positioning Variability in spectrum of disease</p> <p>Imaging Technique including Equipment used, Machine Parameters, Views Obtained, and Imaging Acquisition</p> <p>Reader Variability including Inter-rater variation, Intra-rater variation</p>

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* **Periostitis, Juxta-articular proliferation, Ankylosis, Subluxation, and Osteolysis** remain exploratory domains rather than core target domains for plain radiographic instruments. This acknowledges the potential for inhibition/progression of these features to occur over long periods in specific randomised controlled trials (RCTs) without unnecessarily mandating them for all RCTs, given the number of RCTs that have shown these features to be uncommon, slowly progressive, and non-discriminatory between study arms.

Supplementary Material 3. Randomised Controlled Trials Assessing Radiographic Structural Damage





* Various modifications of the Sharp Score

Supplementary Material 4. Randomised Controlled Trials Assessing Additional Radiographic Features *

	Joint Space Widening	Gross Osteolysis	Subluxation	Pencil-in-Cup	Juxta-articular Periostitis	Shaft Periostitis	Tuft Resorption	Ankylosis
ADEPT 2004 24 Weeks	⊗	⊗	⊗	⊗	⊗	⊗	⊗	
ETANERCEPT 2004 1 Years	⊗	⊗		⊗	⊗	⊗	⊗	⊗
ETANERCEPT 2006 2 Years	⊗	⊗		⊗	⊗	⊗	⊗	⊗
IMPACT 2006 50 Weeks		⊗		⊗				

ADEPT 2007 48 Weeks	⊗	⊗	⊗	⊗	⊗	⊗	⊗	
IMPACT 2008 90 Weeks		⊗		⊗				
IMPACT 2 2007 24 Weeks		⊗		⊗				
GO-REVEAL 2012 24 Weeks		⊗		⊗				
PSUMMIT 1/2 2014 24 Weeks		⊗		⊗				
GO-VIBRANT 2019 24 Weeks		⊗		⊗				

PSUMMIT 1/2 2014 52 Weeks		⊗		⊗				
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* Various modifications of the Sharp Score

Supplementary Material 5. Summary of Peripheral Radiographic Instruments in PsA

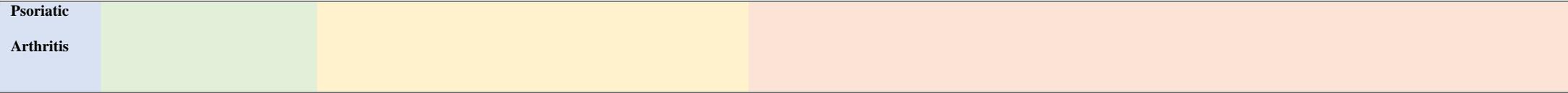
1. A Summary Table which provides an overview of the plain radiography instruments identified for the assessment of peripheral structural damage in the systematic literature review including:
 - (a) The score range
 - (b) The domains assessed and score range for each domain (per joint)
 - (c) Which joints are assessed

2. Individual one page descriptions of each instrument including: (These can also be found on the survey)
 - (a) Pictorial description of joints assessed in the instrument
 - (b) Notes highlighting key features/limitations of the instrument
 - (c) Description of the target domains scored in the instrument
 - (d) Notes regarding training time, time to score and licensing fees where available from literature/authors

Summary of the scoring of each radiographic instrument

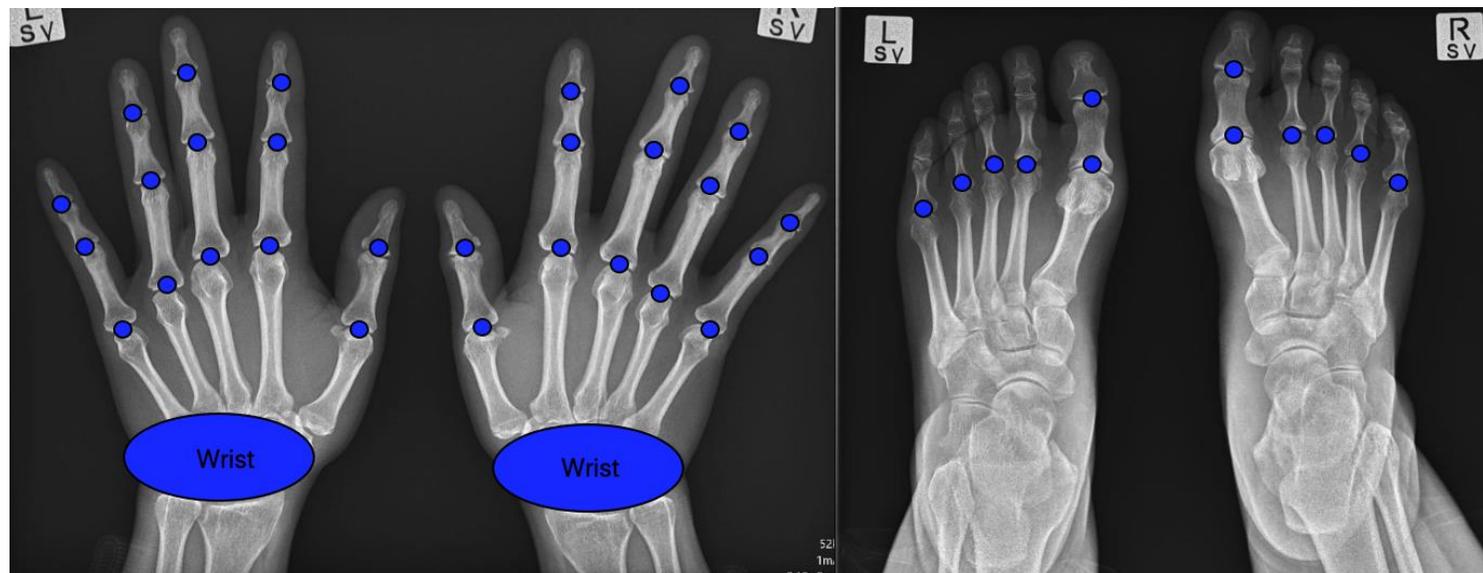
Instrument	Score Range			Features Assessed				Hands				Wrists	Feet
	Hands and Wrists	Feet	Total	Erosion (ERO)	Joint Space Narrowing (JSN)	Osteo Proliferation (OP)	Composite: Damage or Destruction	Number of Joints assessed				Joints assessed	Joints assessed
								MCPs	PIPs	DIPs	1 st IPJs		
Modified Larsen	0-150	0-60	0-210				(0-5)	10	8	8	2	L) Wrist	10 MTPs
												R) Wrist	1 st IPJs
Modified Steinbrocker	0-120	0-48	0-168				(0-4)	10	8	8	2	L) Wrist	10 MTPs
												R) Wrist	1 st IPJs
Ratingen	0-270	0-90	0-360			(0-4)	(0-5)	10	8	8	2	L) Wrist	8 MTPs
												R) Wrist	1 st IPJs

				in hands and wrists only								
Modified Total Sharp Score	0-386	0-160	0-546	(0-5)	(0-4)		10	8	8	2	ERO: 1 st CMC, Trapeziums, Triquetrums, Lunates, Scaphoids, Distal radius/ulna	10 MTPs 1 st IPJs
											JSN: 3 rd -5 th CMCs, Trapezioscapoids, Lunatotriquetrums, Lunatocapitate-scaphoids, Radiocarpals, Radioulnars	
Modified Sharp van der Heijde Score	0-360	0-168	0-528	(0-5 in hands 0-10 in feet)	(0-4)		10	8	8	2	ERO assessed in 1 st CMCs, Trapeziums, Lunates, Scaphoids, Radiocarpals, Ulnacarpals	10 MTPs 1 st IPJs
											JSN assessed in 3 rd -5 th CMCs, Trapezioscapoids, Lunatocapitate-scaphoids, Radiocarpals	(ERO scored on both sides of the joint)
Simplified Psoriatic Arthritis Radiographic Score	0-90	0-30	0-120	(0-1)	(0-1)	(0-1)	10	8	8	2	L) Wrist R) Wrist	8 MTPs 1 st IPJs
Reductive X-Ray Score for	0-144	0-90	0-234	(0-5)	(0-4)	(0-3)	2	2	4	2	L) Radiocarpal R) Radiocarpal	10 MTPs assessed for ERO and JSN



**Psoriatic
Arthritis**

Modified Larsen Score



Notes:

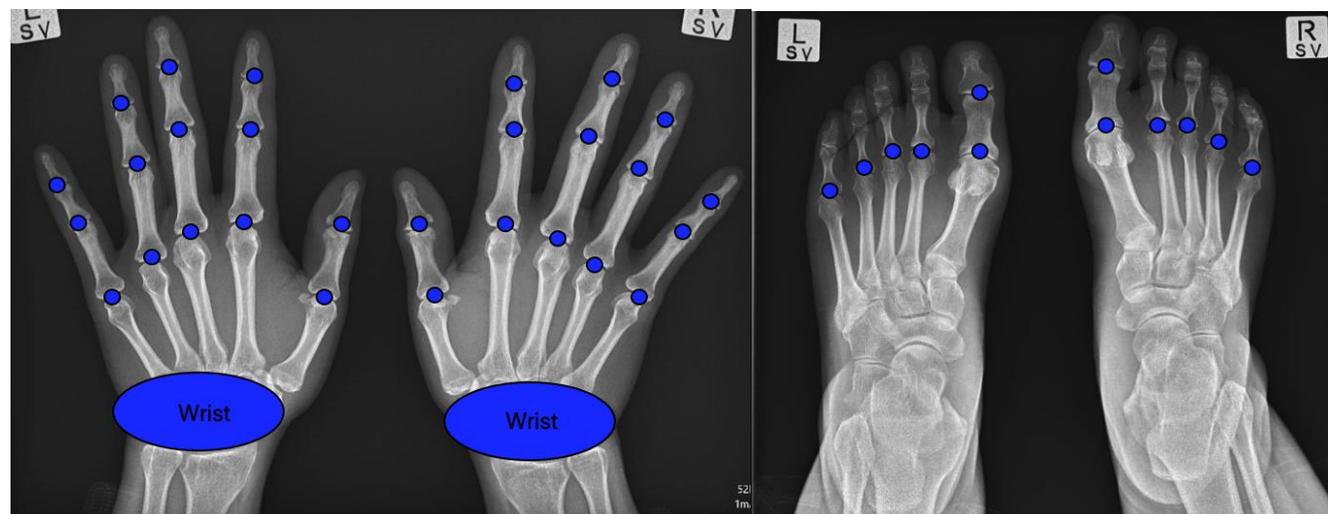
1. Damage assessed as a composite outcome
2. Damage incorporates joint space narrowing, erosions, joint surface destruction, soft tissue swelling and osteoporosis
3. Wrist assessed as a single joint
4. Osteoproliferation not assessed

No licensing fee

Estimated training time/cost:

Not available

Damage 		
Joints Assessed	Description of Scoring	Scoring Range
30 joints in the hands and wrists	0: Normal	Hands and Wrists 0-150
12 joints in the feet	1: Soft tissue swelling, osteoporosis, slight joint space narrowing 2: Erosion with <25% joint surface destruction 3: Erosion with 26-50% joint surface destruction 4: Erosion with 51-75% joint surface destruction 5: >75% joint surface destruction	Feet 0-60

Modified Steinbrocker Score**Notes:**

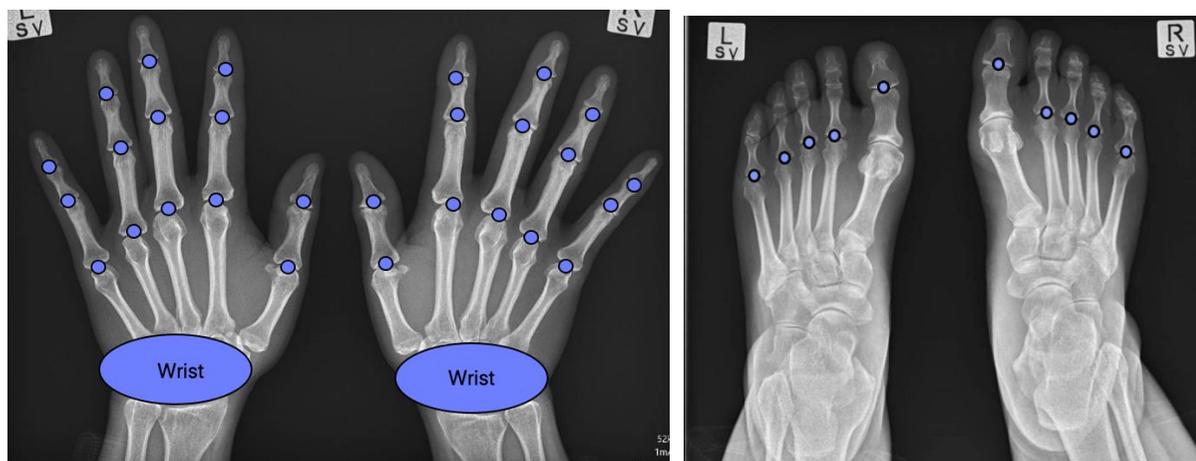
1. Damage assessed as a composite outcome
2. Damage incorporates juxta-articular osteoporosis, soft-tissue swelling, erosions, joint space narrowing, subluxation, lysis and ankyloses
3. Wrist assessed as a single joint
4. Osteoproliferation not assessed
5. No gradation in the severity of joint space narrowing or erosion

No licensing fee for use

Estimated training time:

2 hours to develop familiarity with the components and a further 50 hours to score 100 radiographs covering a range of findings/severity with the supervision of a radiologist followed by a blinded inter- and intra-rater reliability exercise

Damage ●		
Joints Assessed	Description of Scoring	Scoring Range
30 joints in the hands and wrists	0: Normal	Hands and Wrists: 0-120
12 joints in the feet	1: Juxta-articular osteoporosis or soft tissue swelling 2: Erosion 3: Erosion and joint space narrowing or subluxation 4: Total joint destruction either lysis or ankyloses	Feet: 0-48

Ratingen Score

Notes:

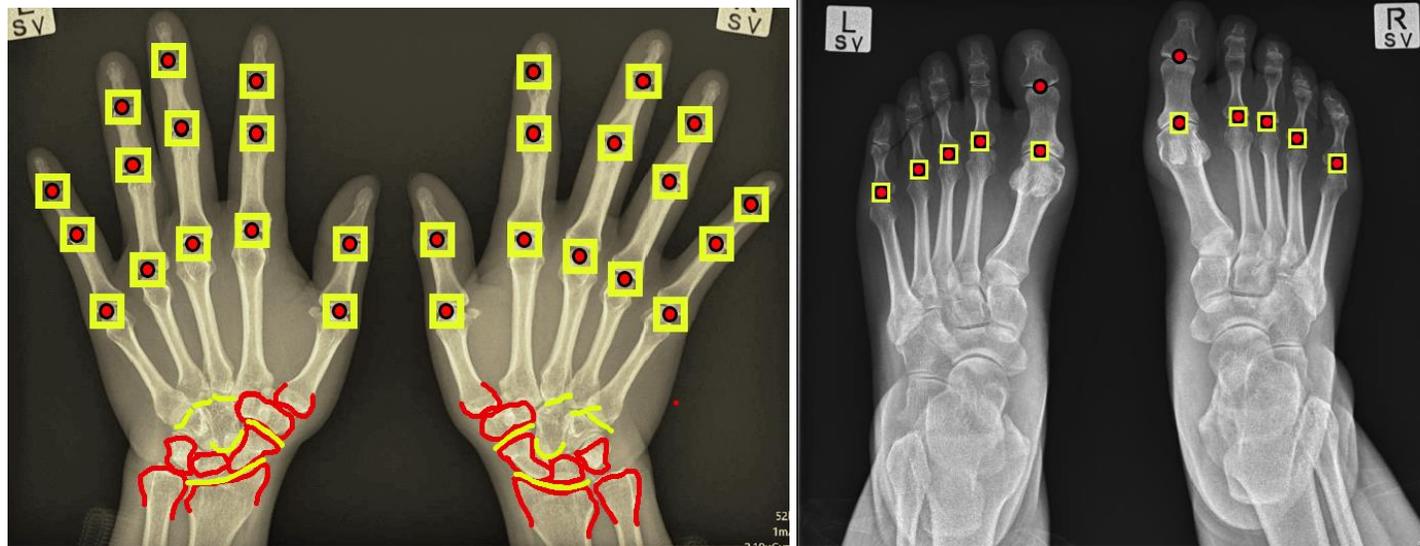
1. Destruction assessed as a composite outcome incorporating erosions and total destruction or ankylosis of the joint space
2. Osteoproliferation assessed
3. 1st MTP excluded
4. Wrist assessed as a single joint

No licensing fee for use

Estimated training time: 2 hours to develop familiarity with the components and a further 50 hours to score 100 radiographs covering a

Destruction			Osteoproliferation		
Joints Assessed	Description of Scoring	Scoring Range	Joints Assessed	Description of Scoring	Scoring Range
30 joints in hands and wrists	0: Normal 1: ≥ 1 definite erosions with an interruption of the cortical plate of >1 mm and	Hands and Wrists: 0-150	30 joints in hands and wrists	0: Normal 1: Bony proliferation of <2 mm or bone growth up to 25% of the original diameter of the bone	Hands and Wrists: 0-120
10 joints in feet	destruction of the total joint surface $<10\%$ 2: 1 or more erosions with destruction of the joint surface of 11-25% 3: 26-50% Joint surface destruction 4: 51-75% Joint surface destruction 5: Total destruction of the joint space $>75\%$ or Ankylosis	Feet: 0-50	10 joints in feet	2: Bony proliferation of 2-3mm or bone growth of 26-50% of the original diameter of the bone 3: Bony proliferation of >3 mm or bone growth $>50\%$ of the original diameter of the bone 4: Bony ankyloses	Feet: 0-40

Modified Total Sharp Score (mTSS-B)



Notes:

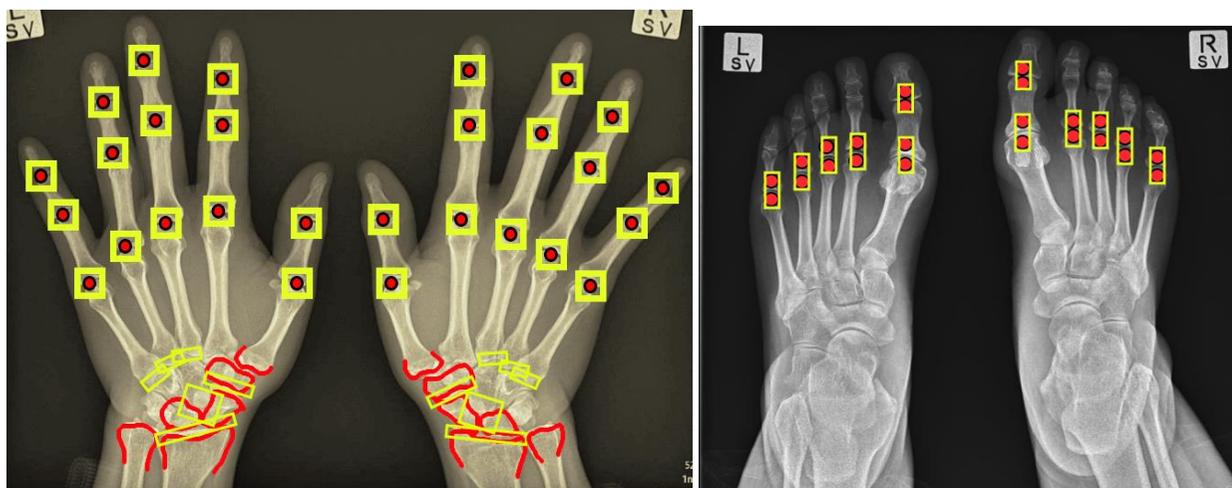
1. Osteoproliferation not assessed
2. Wrist joints assessed in specific articulations rather than as a whole
3. JSN not assessed in 1st IPj of feet

No licensing fee for use. Clinicians paid for scoring radiographs in RCTs

Estimated training time: 2 hours to develop familiarity with the components and a further 50 hours to score 100

Erosions ●	Joint Space Narrowing □
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Joints Assessed	Description of Scoring	Scoring Range	Joints Assessed	Description of Scoring	Scoring Range
42 joints in hands and wrists	0: No Erosion 1: One discrete erosion or involvement of <21% of the joint area by erosion 2: Two discrete erosions or involvement of 21-40% of the joint area by erosion 3: Three discrete erosions or involvement of 41-60% of the joint area by erosion 4: Four discrete erosions or involvement of 61-80% of the joint area by erosion 5: Extensive destruction involving >80% of the joint	Hands and Wrists: 0-210 Feet: 0-120 Total: 0-330	44 joints in hands and wrists	0: Normal Joint 1: Asymmetrical and/or minimal narrowing 2: Definite narrowing with loss of up to 50% of the normal space 3: Definite narrowing with loss of 51-99% of the normal space 4: No joint space, presumptive ankyloses	Hands and Wrists: 0-176 Feet: 0-40 Total: 0-216
12 joints in feet	Scored on both sides of the joint in feet for a maximum score of 10 per joint				

Modified Sharp van der Heijde Score (mSvdHs)**Notes:**

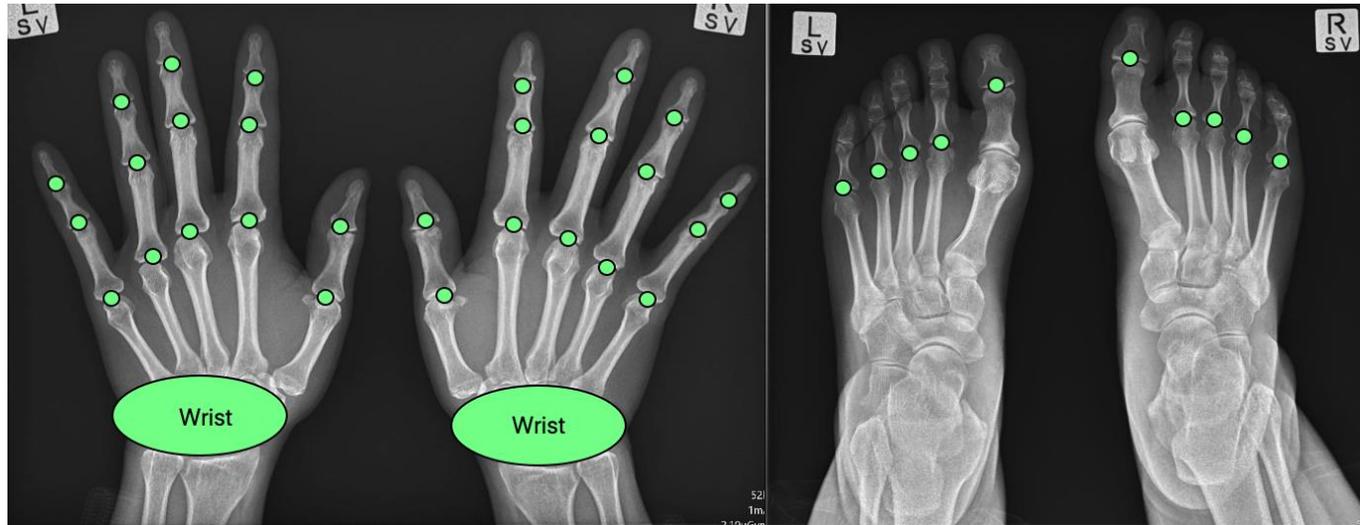
1. Osteoproliferation not assessed
2. Wrist joints assessed in specific articulations rather than as a whole
3. ERO assessed on both sides of the joints in the feet

No licensing fee for use. Clinicians paid for scoring radiographs in RCTs

Estimated training time: 2 hours to develop familiarity with the components and a further 50

Erosions 			Joint Space Narrowing 		
Joints Assessed	Description of Scoring	Scoring Range	Joints Assessed	Description of Scoring	Scoring Range
40 joints in hands and wrists 12 joints in feet	0: No Erosion 1: 1 discrete erosion or involvement of <21% of the joint area by erosion 2: 2 discrete erosions or involvement of 21-40% of the joint area by erosion 3: 3 discrete erosions or involvement of 41-60% of the joint area by erosion 4: 4 discrete erosions or involvement of 61-80% of the joint area by erosion 5: Extensive destruction involving >80% of the joint Scored on both sides of the joint in feet for a maximum score of 10 per joint	Hands and Wrists: 0-200 Feet: 0-120 Total: 0-320	40 joints in hands and wrists 12 joints in feet	0: Normal Joint 1: Asymmetrical and/or minimal narrowing 2: Narrowing with loss of up to 50% of the normal space 3: Narrowing with loss of 51-99% of the normal space 4: Absence of a joint space, presumptive evidence of ankyloses	Hands and Wrists: 0-160 Feet: 0-48 Total: 0-208

Simplified Psoriatic Arthritis Radiographic Score



Notes:

1. Osteoproliferation assessed
2. ERO, JSN and OP assessed as binary outcomes in each joint
3. Wrist assessed as a single joint
4. 1st MTPs excluded

No licensing fee.

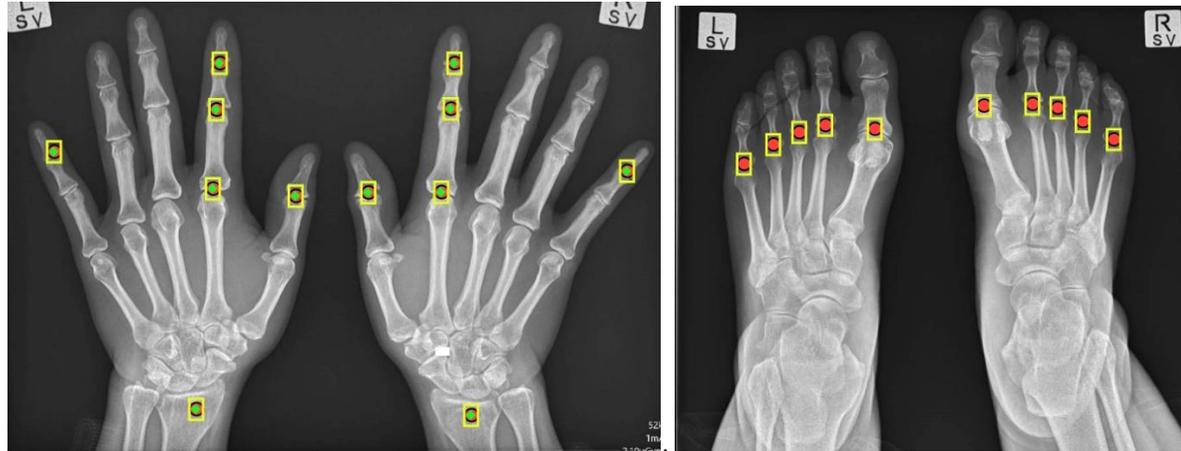
Estimated training time:

4 hours in clinicians familiar with plain radiography in PsA (from developers)

Erosions 			Joint Space Narrowing 			Osteoproliferation 		
Joints Assessed	Description of Scoring	Scoring Range	Joints Assessed	Description of Scoring	Scoring Range	Joints Assessed	Description of Scoring	Scoring Range

<p>30 joints in hands and wrists</p> <p>10 joints in feet</p>	<p>0: Normal</p> <p>1: One or more erosions with an interruption of the cortical plate >1mm</p>	<p>Hands and Wrists: 0-30</p> <p>Feet: 0-10</p> <p>Total: 0-40</p>	<p>30 joints in hands and wrists</p> <p>10 joints in feet</p>	<p>0: Normal</p> <p>1: At least an asymmetrical or minimal narrowing detectable (mSvdHS grade 1)</p>	<p>Hands and Wrists: 0-30</p> <p>Feet: 0-10</p> <p>Total: 0-40</p>	<p>30 joints in hands and wrists</p> <p>10 joints in feet</p>	<p>0: Normal</p> <p>1: Proliferation of 1-2mm or bone growth >25% of the diameter of the bone detectable</p>	<p>Hands and Wrists: 0-30</p> <p>Feet: 0-10</p> <p>Total: 0-40</p>
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Reductive X-Ray Score for Psoriatic Arthritis (ReXSPA)



Notes:

1. Osteoproliferation assessed in hands only
2. Limited number of joints assessed (instrument derived from data reduction in 50 patients)

No licensing fee

Estimated training time: 2 hours to develop familiarity with the components and a further 50 hours to score 100

Erosions 			Joint Space Narrowing 			Osteoproliferation 		
Joints Assessed	Description of Scoring	Scoring Range	Joints Assessed	Description of Scoring	Scoring Range	Joints Assessed	Description of Scoring	Scoring Range
12 joints in hands	0: No Erosion 1: 1 discrete erosion or involvement	Hands and wrists	12 joints in hands and wrists	0: Normal 1: Asymmetrical minimal	Hands and wrists	12 joints in hands and wrists	0: Normal 1: 1-2mm proliferation	Hands and Wrists: 0-36

and wrists	of <21% of the joint area by erosion	Wrists: 0-60	10 joints in feet	narrowing – loss of < 25%	Wrists: 0-48		measured from the original surface or clear bone growth <25% of the original diameter of the bone
10 joints in feet	2: 2 discrete erosions or involvement of 21-40% of the joint area by erosion	Feet: 0-50		2: Definite narrowing- loss of <50% of the normal space	Feet: 0-40		2: Bony proliferation of 2-3mm or bone growth 25-50%
	3: 3 discrete erosions or involvement of 41-60% of the joint area by erosion	Total: 0-110		3: Definite narrowing – loss of 50-99% of the normal space or subluxation	Total: 0-88		3: Bony proliferation >3mm or bone growth >50%
	4: 4 discrete erosions or involvement of 61-80% of the joint area by erosion			4: Absence of a joint space presumptive evidence of ankyloses or complete subluxation			
	5: Extensive destruction involving >80% of the joint						

Supplementary Material 6. Working Group Domain Match Voting Results

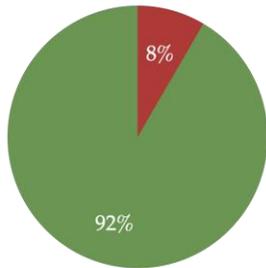
DOMAIN MATCH	Modified Larsens	Modified Steinbrocker	Ratingen	mTSS	mSvdHs	SPARS	ReXSPA
Is this instrument measuring what you want it to measure (i.e. structural damage)?	Yes 9 (69%) Uncertain 2 (15%) No 2 (15%)	Yes 8 (62%) Uncertain 2 (15%) No 3 (23%)	Yes 9 (69%) Uncertain 1 (8%) No 3 (23%)	Yes 13 (100%)	Yes 12 (92%) Uncertain 1 (8%)	Yes 12 (92%) No 1 (8%)	Yes 10 (77%) Uncertain 1 (8%) No 2 (15%)
Is the instrument free of redundant or unnecessary items?	Yes 8 (62%) Uncertain 3 (23%) No 2 (15%)	Yes 9 (69%) Uncertain 2 (15%) No 2 (15%)	Yes 8 (62%) Uncertain 3 (23%) No 2 (15%)	Yes 8 (62%) Uncertain 3 (23%) No 2 (15%)	Yes 9 (69%) Uncertain 3 (23%) No 1 (8%)	Yes 9 (69%) Uncertain 2 (15%) No 2 (15%)	Yes 10 (77%) Uncertain 3 (23%)
Have all important items been included (consider the items included and the joints included)?	Yes 2 (15%) Uncertain 3 (23%) No 8 (62%)	Yes 3 (23%) Uncertain 3 (23%) No 7 (54%)	Yes 4 (31%) Uncertain 2 (15%) No 7 (54%)	Yes 4 (31%) Uncertain 4 (31%) No 5 (38%)	Yes 6 (46%) Uncertain 5 (38%) No 2 (15%)	Yes 3 (23%) Uncertain 4 (31%) No 6 (46%)	Uncertain 5 (38%) No 8 (62%)
Is the item 'Damage' clearly described?	Yes 9 (69%) Uncertain 1 (8%) No 3 (23%)	Yes 9 (69%) No 4 (31%)	X	X	X	X	X

Is the item 'Destruction' clearly described?	X	X	Yes 11 (85%) Uncertain 1 (8%) No 1 (8%)	X	X	X	X
Is the item 'Osteoproliferation' clearly described?	X	X	Yes 10 (66%) Uncertain 1 (7%) No 2 (15%)	X	X	Yes 8 (62%) Uncertain 1 (8%) No 4 (31%)	Yes 9 (69%) Uncertain 2 (15%) No 2 (15%)
Is the item 'Erosions' clearly described?	X	X	X	Yes 8 (62%) Uncertain 1 (8%) No 4 (31%)	Yes 8 (62%) Uncertain 1 (8%) No 4 (31%)	Yes 9 (69%) Uncertain 1 (8%) No 3 (23%)	Yes 7 (54%) Uncertain 1 (8%) No 4 (31%)
Is the item 'JSN' clearly described?	X	X	X	Yes 11 (85%) No 2 (15%)	Yes 11 (85%) No 2 (15%)	Yes 6 (46%) Uncertain 1 (8%) No 5 (38%)	Yes 11 (85%) No 2 (15%)
Are the responses suitable and complete for each item in the instrument?	Yes 4 (31%) Uncertain 2 (15%) No 7 (54%)	Yes 5 (38%) Uncertain 1 (8%) No 7 (54%)	Yes 9 (69%) Uncertain 1 (8%) No 3 (23%)	Yes 11 (85%) Uncertain 2 (15%)	Yes 12 (92%) Uncertain 1 (8%)	Yes 8 (62%) Uncertain 1 (8%) No 4 (31%)	Yes 9 (69%) Uncertain 2 (15%) No 2 (15%)

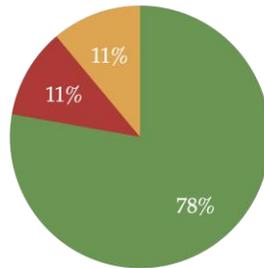
Is the method of scoring in this instrument appropriate (consider weighting of responses)?	Yes 7 (54%) Uncertain 3 (23%) No 3 (23%)	Yes 2 (15%) Uncertain 4 (31%) No 7 (54%)	Yes 9 (69%) Uncertain 2 (15%) No 2 (15%)	Yes 11 (85%) Uncertain 2 (15%)	Yes 11 (85%) Uncertain 2 (15%)	Yes 5 (38%) Uncertain 3 (23%) No 5 (38%)	Yes 6 (46%) Uncertain 5 (38%) No 2 (15%)
ROUND 1 VOTES (n=13)							
GOOD TO GO	1 (8%)	1 (8%)	3 (23%)	6 (46%)	8 (62%)	2 (15%)	0 (0%)
SOME CAUTIONS BUT OK	6 (46%)	6 (46%)	5 (38%)	7 (54%)	5 (38%)	6 (46%)	7 (54%)
NOT APPROPRIATE	6 (46%)	6 (46%)	5 (38%)	0 (0%)	0 (0%)	5 (38%)	6 (46%)
ROUND 1 RESULT	RED	RED	RED	AMBER	GREEN	RED	RED
ROUND 2 VOTES (n=14)							
GOOD TO GO	0 (0%)	0 (0%)	2 (14%)	8 (57%)	9 (64%)	0 (0%)	0 (0%)
SOME CAUTIONS	4 (29%)	4 (29%)	6 (43%)	5 (36%)	5 (36%)	4 (29%)	4 (29%)
NOT APPROPRIATE	10 (71%)	10 (71%)	6 (43%)	1 (7%)	0 (0%)	10 (71%)	10 (71%)
ROUND 2 RESULT	RED	RED	RED	GREEN	GREEN	RED	RED

7. Patient Research Partner Feasibility Results (n=9)

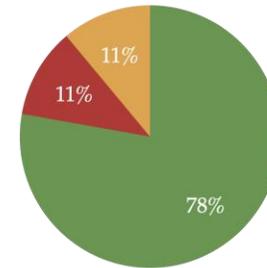
Have you had X-Rays of your Hands and Feet before?



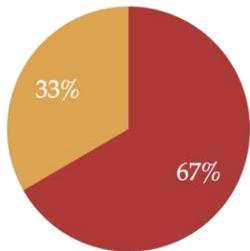
Does it seem easy enough to have X-Rays of your hands and feet done?



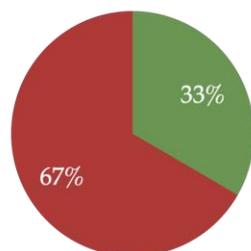
Is the amount of taken to have X-Rays of your hands and feet reasonable?



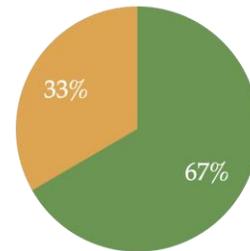
Do you feel there is any significant harm from having X-Rays of your hands and feet?



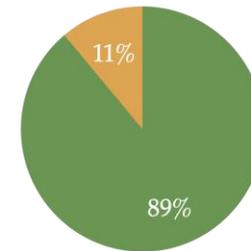
Do you think there is any discomfort from having X-Rays of your hands and feet?



Are the costs associated with having X-Rays of your hands and feet (if any) acceptable to you?



Do you think there may be any benefits to having X-Rays of your hands and feet?



● Yes ● No ● Uncertain

Supplementary Material 8. Working Group Feasibility Voting Results

FEASIBILITY	Modified Larsen	Modified Steinbrocker	Ratingen	mTSS	mSvdHs	SPARS	ReXPAs
Can radiographic acquisition and scoring be completed within a reasonable amount of time in the context of an RCT?	Yes 9 (69%) Uncertain 2 (15%) No 2 (15%)	Yes 11 (85%) Uncertain 1 (8%) No 1 (8%)	Yes 10 (77%) Uncertain 2 (15%) No 1 (8%)	Yes 8 (62%) Uncertain 2 (15%) No 3 (23%)	Yes 8 (62%) Uncertain 3 (23%) No 2 (15%)	Yes 12 (92%) Uncertain 1(8%) No 0 (0%)	Yes 9 (69%) Uncertain 3 (23%) No 1 (8%)
Is the method of training feasible (i.e. equipment and training needed)	Yes 8 (62%) Uncertain 3 (23%) No 2 (15%)	Yes 9 (69%) Uncertain 2 (23%) No 2 (15%)	Yes 9 (69%) Uncertain 2 (23%) No 2 (15%)	Yes 9 (69%) Uncertain 2 (23%) No 2 (15%)	Yes 10 (77%) Uncertain 1 (8%) No 2 (15%)	Yes 10 (77%) Uncertain 2 (15%) No 1 (8%)	Yes 8 (62%) Uncertain 3 (23%) No 2 (15%)
Are the costs feasible? (Consider licensing fees, equipment and training costs)	Yes 11 (85%) Uncertain 2 (15%)	Yes 11(85%) Uncertain 2 (15%)	Yes 9 (69%) Uncertain 4 (31%)	Yes 10 (77%) Uncertain 3 (23%)	Yes 10 (77%) Uncertain 3 (23%)	Yes 11 (85%) Uncertain 2 (15%)	Yes 11 (85%) Uncertain 2 (15%)
Are the copyright issues (if any) reasonable and manageable?	Yes 11 (85%) Uncertain 2 (15%)	Yes 11 (85%) Uncertain 2 (15%)	Yes 9 (69%) Uncertain 4 (31%)	Yes 9 (69%) Uncertain 4 (31%)	Yes 9 (69%) Uncertain 4 (31%)	Yes 11 (85%) Uncertain 2 (15%)	Yes 11 (85%) Uncertain 2 (15%)
ROUND 1 VOTES (n=13) GOOD TO GO SOME CAUTIONS NOT APPROPRIATE	2 (15%) 8 (62%) 3 (23%)	3 (23%) 7 (54%) 3 (23%)	3 (23%) 8 (62%) 2 (15%)	6 (46%) 7 (54%) 0 (0%)	7 (54%) 6 (46%) 0 (0%)	3 (23%) 7 (54%) 3 (23%)	2 (15%) 7 (54%) 4 (31%)
ROUND 1 RESULT	RED	RED	AMBER	AMBER	GREEN	RED	RED
ROUND 2 VOTES (n=14) GOOD TO GO SOME CAUTIONS NOT APPROPRIATE	0 (0%) 10 (71%) 4 (29%)	1 (7%) 10 (71%) 3 (21%)	0 (0%) 13 (93%) 1 (7%)	3 (21%) 11 (79%) 0 (0%)	3 (21%) 11 (79%) 0 (0%)	0 (0%) 12 (86%) 2 (14%)	0 (0%) 12 (86%) 2 (14%)
ROUND 2 RESULT	RED	RED	AMBER	AMBER	AMBER	AMBER	AMBER