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SUPPLEMENTARY MATERIAL

Development of an algorithm for optimizing the implementation of ultrasound in the diagnostic workflow in clinical practice: preliminary phase of the RADIAL study, a project of the US Study Group of the Italian Society for Rheumatology

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Supplementary Table 1. Ranking of the variables in the surveys.

RA	*PsA*	*PMR*	*gout*	*CPPD*	*OA*
Positive RF/ACPA	Negative RF/ACPA	Age>50	Arthritis	Negative RF/ACPA	Negative RF/ACPA
Polyarticular>oligoarticular>monoarticular	Elevated ESR and CRP	Elevated ESR and CRP	Negative RF/ACPA	Age≥50 years	Age≥50 years
Arthritis	Polyarticular>oligoarticular>monoarticular	Polyarticular>oligoarticular>monoarticular	Monoarticular >oligoarticular >polyarticular	Arthritis	Symptom duration>3 months
Elevated ESR and CRP	Age<50 years	Negative RF/ACPA	Elevated ESR and CRP	Monoarticular >oligoarticular >polyarticular	Polyarticular> oligoarticular> monoarticular
Female sex	Symptom duration>3 months	Arthritis	Male sex	Elevated ESR and CRP	Female sex
Symptom duration>3 months	Female sex	Male sex	Age≥50 years	Symptom duration>3 months	Arthritis
Age≥50 years		Symptom duration>3 months	Symptom duration>3 months	Female sex	

RA, rheumatoid arthritis; PsA, psoriatic arthritis; PMR, polymyalgia rheumatica; CPPD, calcium pyrophosphate deposition disease; OA, osteoarthritis; RF, rheumatoid factor; ACPA, anti-cyclic citrullinated peptide antibodies; ESR, erythrosedimentation rate; CRP, C reactive protein.

Supplementary Table 2. Diagnosis based on the algorithm and final diagnosis defined by the clinician.

	Final diagnosis					
Algorithm's diagnosis	CPPD	Gout	OA	PMR	PSA	RA
Gout/CPPD/PsA	1	1	0	0	1	**1**
Gout/CPPD/RA/PsA	0	1	0	0	0	1
OA/CPPD/PsA	2	**1**	6	0	3	0
OA/CPPD/RA/PsA	0	0	2	0	0	3
PMR/RA/PsA	**1**	0	**3**	8	4	15
PsA	0	0	**1**	0	1	0
RA/PsA	0	0	0	0	1	2

Results in bold represent disagreement. RA, rheumatoid arthritis; PsA, psoriatic arthritis; PMR, polymyalgia rheumatica; CPPD, calcium pyrophosphate deposition disease; OA, osteoarthritis.

Supplementary Table 3. Characteristics of the misclassified patients.

Patient	**RF/ACPA**	**Acute phase reactants**	**Age> 50 yrs**	**Joint involvement**	**Algorithm diagnosis**	**Final diagnosis**
1	-	+	+	Polyarticular	PMR/RA/Psa	CPPD
2	-	-	+	NA	OA/CPPD/PsA	Gout
3	-	+	NA	Monoarticular	Gout/CPPD/PsA	RA
4	-	+	+	Polyarticular	PMR/RA/PsA	OA
5	-	+	+	Polyarticular	PMR/RA/PsA	OA
6	-	+	+	Polyarticular	PMR/RA/PsA	OA
7	-	-	-	NA	PsA	OA

RA, rheumatoid arthritis; PsA, psoriatic arthritis; PMR, polymyalgia rheumatica; CPPD, calcium pyrophosphate deposition disease.

Supplementary Table 4. Final statements.

RA	▪ The MCPs II-V and the wrists seem to be the set of joints with the best ratio of accuracy and feasibility for detecting the presence of GS synovitis and PD. ▪ A GS-synovitis and PD score > 1 at more than 2 joints of the hands is suggestive of the development of rheumatoid arthritis from an early undifferentiated arthritis. ▪ The presence of erosions at level of V MTP or the identification of an erosion ≥2,5 mm at MCPs is suggestive of RA.
PsA	▪ The US assessment of peritendinitis (GS+PD) on MCP (II-III) and PIP joints (central slip enthesitis + soft tissue oedema – not SLR based) is useful in confirming the diagnosis of PsA. ▪ The hand soft tissue oedema by US around flexor tendons is specific in confirming the diagnosis of PsA. ▪ The entheseal PD (< 2mm) (Achilles tendon and proximal insertion of patellar ligament) MSUS assessment can help to confirm the clinical suspicion of PsA ▪ The entheseal erosion (Achilles tendon and proximal insertion of patellar ligament) US assessment can help to confirm the clinical suspicion of PsA
PMR	▪ The bilateral presence of SAD bursitis may be suggestive for PMR ▪ The unilateral presence of bursitis/arthritis/tenosynovitis of the long head of the biceps at the shoulders might suggest PMR. ▪ The evaluation of the rotator cuff conditions is useful to exclude other shoulder pathologies that could be the cause of the clinical and US findings.
Gout	▪ In case of acute arthritis, the presence of the double contour at the affected joint is useful to suspect the diagnosis. The absence doesn't exclude it. ▪ In the acute arthritis of any joint, the presence of lesions suggesting the deposition of MSU crystals (double contour and/or tophi) at I MTP and knees is useful to suspect the diagnosis. ▪ In case of acute involvement of periarticular structures (bursitis, tenosynovitis), the presence of lesions suggesting the deposition of MSU crystals (double contour and/or tophi) at the level of the affected site, is useful to suspect the diagnosis. ▪ In case of a previous arthritis acute attack, the presence of double contour and/or tophi at the joint previously affected, and/or at level of I MTP and knees is useful to direct the diagnosis with high specificity.
CPPD	▪ The menisci, the knee hyaline cartilage and the triangular fibrocartilage of the wrist are the sites to scan in order to confirm the presence of the typical CPP deposits. ▪ The menisci are the most accurate and reliable sites, but the absence of CPP deposits at this level doesn't exclude CPPD diagnosis.
OA	▪ The absence of any US pathological findings doesn't exclude the diagnosis of OA. ▪ The presence of osteophytes is suggestive of OA at level of the scanned joint ▪ The advanced changes of the hyaline cartilage (thinning, loss, irregularities of the cartilage margins) are strongly suggestive of OA. ▪ The presence of effusion/synovitis doesn't allow to confirm or exclude the diagnosis of OA.

RA, rheumatoid arthritis; PsA, psoriatic arthritis; PMR, polymyalgia rheumatica; CPPD, calcium pyrophosphate deposition disease; OA, osteoarthritis; MCP, metacarpophalangeal; PIP, proximal interphalangeal; MTP, metatarsophalangeal; GS, grey scale; PD, power Doppler; CPP, calcium pyrophosphate; US, ultrasonography; SAD, subacromial deltoid; SLR, systematic literature review.