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## Definition of Periprosthetic Joint Infection



## To the Editor:

Diagnosis of periprosthetic joint infection (PJI) remains challenging as no “gold standard” for diagnosis exists [3]. The challenge is then what test(s) or criterion(ia) can be used to define PJI. In an effort to standardize the definition of PJI, Musculoskeletal Infection Society (MSIS) convened a workgroup in 2011 to issue diagnostic criteria for PJI [1]. The MSIS definition of PJI consists of two major criteria, when the presence of either criterion would indicate PJI, and six minor criteria, when the presence of four or more would indicate PJI.

In August 2013 a large group of experts convened together in Philadelphia as part of an International Consensus Meeting on PJI. The consensus group, consisting of 400 experts from 52 countries and over 130 societies, met just ahead of the annual meeting of the MSIS. The consensus group endorsed the MSIS definition of PJI and modified the MSIS criteria slightly by adding the leukocyte esterase test as a minor criterion (Table 1). The document generated by the consensus group, including the diagnostic criteria for PJI, has been adopted by over 130 societies and organizations [2]. The diagnostic criteria introduced by the MSIS and modified by the International Consensus group has been adapted by the Center for Disease Control and will replace the previous definition of PJI that was used by the National Healthcare Safety Network (NHSN), surveillance arm of the CDC.

**Table 1**  
Definition of Periprosthetic Joint Infection According to the International Consensus Group. This Is An Adaptation of the Musculoskeletal Infection Society Definition of PJI.

PJI Is Present When One of the Major Criteria Exists or Three Out of Five Minor Criteria Exist	
Major Criteria	Two positive periprosthetic cultures with phenotypically identical organisms, <b>OR</b> A sinus tract communicating with the joint, <b>OR</b>
Minor Criteria	1) Elevated serum C-reactive protein (CRP) <b>AND</b> erythrocyte sedimentation rate (ESR) 2) Elevated synovial fluid white blood cell (WBC) count <b>OR</b> ++ change on leukocyte esterase test strip 3) Elevated synovial fluid polymorphonuclear neutrophil percentage (PMN%) 4) Positive histological analysis of periprosthetic tissue 5) A single positive culture

Declaration: The consensus group wishes to state that PJI may be present without meeting these criteria, specifically in the case of less virulent organisms (e.g. *Propionibacterium acnes*). Thus, the clinicians are urged to exercise their judgment and clinical acumen in reaching the diagnosis of PJI.

The Conflict of Interest statement associated with this article can be found at <http://dx.doi.org/10.1016/j.arth.2014.03.009>.

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**Table 2**  
The Threshold for the Minor Diagnostic Criteria.

Criterion	Acute PJI (<90 days)	Chronic PJI (>90 days)
Erythrocyte Sedimentation Rate (mm/hr)	Not helpful. No threshold was determined	30
C-Reactive Protein (mg/L)	100	10
Synovia White Blood Cell Count (cells/ $\mu$ l)	10,000	3,000
Synovial Polymorphonuclear (%)	90	80
Leukocyte Esterase	+ Or ++	+ Or ++
Histological Analysis of Tissue	>5 neutrophils per high power field in 5 high power fields ( $\times$ 400)	Same as acute

The consensus group also determined the acceptable threshold for the minor criteria, based on acuity of the infections (Table 2). The consensus group felt that there was no difference in the threshold for the minor criteria between total knee and total hip arthroplasties.

The consensus group also proposed an algorithmic approach to diagnosis of PJI that is based on the recommendations of the American Academy of Orthopedic Surgeons.

It is hoped that the proposed diagnostic criteria will aid clinicians in their effort to diagnose and treat PJI. The availability of a standardized definition for PJI will allow a meaningful comparison of the medical literature reporting on issues related to PJI. It is abundantly clear that with the progress in molecular biology and in particular the biomarker science, a single test for diagnosis of PJI may indeed be within the reach of the medical community.

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The International Consensus Group on Periprosthetic Joint Infection

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