■ INFOGRAPHIC

# Infographic: The EBJIS definition of periprosthetic joint infection

## A PRACTICAL GUIDE FOR CLINICIANS

**M. McNally,**
**R. Sousa,**
**M. Wouthuyzen-Bakker,**
**A. F. Chen,**
**A. Soriano,**
**H. C. Vogely,**
**M. Clauss,**
**C. A. Higuera,**
**R. Trebše**

Periprosthetic joint infection (PJI) remains a major concern for surgeons and patients. It presents a large burden for healthcare systems, requiring expensive, invasive treatments, which are not always successful.[1,2] Effective treatment starts with accurate diagnosis.

Previous definitions of PJI have been helpful and provided reference standards for diagnostic studies,[3-5] but no single definition has been adopted.[6] The European Bone & Joint Infection Society (EBJIS) has therefore worked with the Musculoskeletal Infection Society (MSIS) and the European Society of Clinical Microbiology and Infectious Diseases (ESCMID) Study Group for Implant-Associated Infections (ESGIAI) to produce a new definition, derived from the most robust evidence on diagnosis of PJI. This fulfils the two primary roles of a definition. Firstly, it provides a practical guide for clinicians to decide if an infection is present or not, based on widely available investigations. Secondly, it facilitates researchers to perform studies in patients with confirmed infection or not.

The elements of the definition were chosen on the specificity or sensitivity of each test. Unfortunately, we do not have any perfect tests, and currently we have no tests which can reliably exclude infection. A test with a high specificity (such as histology) is only positive in those with infection and so can be used to confirm the presence of infection. Sensitive tests can suggest the presence of infection but will not confirm it unless they also have high specificity. As new tests are evaluated, they can be added.

The novel 'traffic light' approach divides patients by the likelihood of infection (green or amber) or confirmed infection (red). It recognizes the difficulty of trying to create a simplistic 'black or white' definition of PJI.[6,7] This mirrors the approach in the recent Consensus Definition of Fracture-Related Infection.[8,9]

We hope that this work helps clinicians of all expertise and allows informed discussions with patients about the diagnosis of PJI. The definition is now undergoing validation trials and we welcome further work on this.

## References

1. **Middleton R, Khan T, Alvand A.** Update on the diagnosis and management of prosthetic joint infection in hip and knee arthroplasty. *Bone Joint 360.* 2019;8(4):5–13.
2. **Kurtz SM, Lau E, Watson H, Schmier JK, Parvizi J.** Economic burden of periprosthetic joint infection in the United States. *J Arthroplasty.* 2012;27(8)(suppl):61–5.e1.
3. **Parvizi J, Gehrke T; International Consensus Group on Periprosthetic Joint Infection.** Definition of periprosthetic joint infection. *J Arthroplasty.* 2014;29(7):1331.
4. **Osmon DR, Berbari EF, Berendt AR, et al; Infectious Diseases Society of America.** Diagnosis and management of prosthetic joint infection: clinical practice guidelines by the Infectious Diseases Society of America. *Clin Infect Dis.* 2013;56(1):e1–e25.
5. **Shohat N, Bauer T, Buttaro M, et al.** Hip and knee section, what is the definition of a periprosthetic joint infection (PJI) of the knee and the hip? can the same criteria be used for both joints?: proceedings of international consensus on orthopedic infections. *J Arthroplasty.* 2019;34(2S):S325–S327.
6. **Villa JM, Pannu TS, Piuzzi N, Riesgo AM, Higuera CA.** Evolution of diagnostic definitions for periprosthetic joint infection in total hip and knee arthroplasty. *J Arthroplasty.* 2020;35(3S):S9–S13.
7. **Oussedik S, Gould K, Stockley I, Haddad FS.** Defining periprosthetic infection; do we have a workable gold standard? *Bone Joint J.* 2012;94-B:1455–1456.
8. **McNally M, Govaert G, Dudareva M, Morgenstern M, Metsemakers W-J.** Definition and diagnosis of fracture-related infection. *EFORT Open Rev.* 2020;5(10):614–619.
9. **Govaert GAM, Kuehl R, Atkins BL, et al; Fracture-Related Infection (FRI) Consensus Group.** Diagnosing fracture-related Infections: current concepts and recommendations. *J Orthop Trauma.* 2020;34(1):8–17.

**Author information:**

M. McNally, MB, BCh, MD, FRCS(Orth), EBJIS Past-President, The Bone Infection Unit, Nuffield Orthopaedic Centre, Oxford University Hospitals, Oxford, UK.

R. Sousa, MD, PhD, EBJIS Executive Committee Member, Porto Bone Infection Group (GRIP), Orthopaedic Department, Centro Hospitalar Universitário do Porto, Porto, Portugal.

M. Wouthuyzen-Bakker, MD, PhD, ESGIAI Chair, Department of Medical Microbiology and Infection Prevention, University of Groningen, University Medical Center Groningen, Groningen, Netherlands.

A. F. Chen, MA, MBA, Director of Research, Arthroplasty Services, Director of Research, Arthroplasty Services, Brigham and Women's Hospital, Boston, Massachusetts, USA.

A. Soriano, MD, EBJIS Vice-President, ESCMID Fellow, Head of Infectious Diseases Department, Hospital Clinic of Barcelona, Barcelona, Spain.

H. C. Vogely, MD, PhD, EBJIS General Secretary, Orthopaedic Surgeon, Department of Orthopaedics, University Medical Center Utrecht, Utrecht, Netherlands.

M. Clauss, MD, EBJIS Treasurer, Head of the Center for Musculoskeletal Infections, Department of Orthopaedics and Trauma Surgery, University Hospital Basel, Basel, Switzerland.

C. A. Higuera, MD, FAAOS, MSIS President, Levitetz Department of Orthopaedic Surgery, Cleveland Clinic, Florida, USA.

R. Trebše, MD, PhD, EBJIS President, Head of Bone Infection, Orthopaedic Hospital Valdoltra, Ankaran, Slovenia.



Correspondence should be sent to M. McNally; email: martin. mcnally@ouh.nhs.uk


doi:10.1302/0301-620X.103B1.BJJ-2020-2417 $2.00

*Bone Joint J*
2021;103-B(1):16–17.

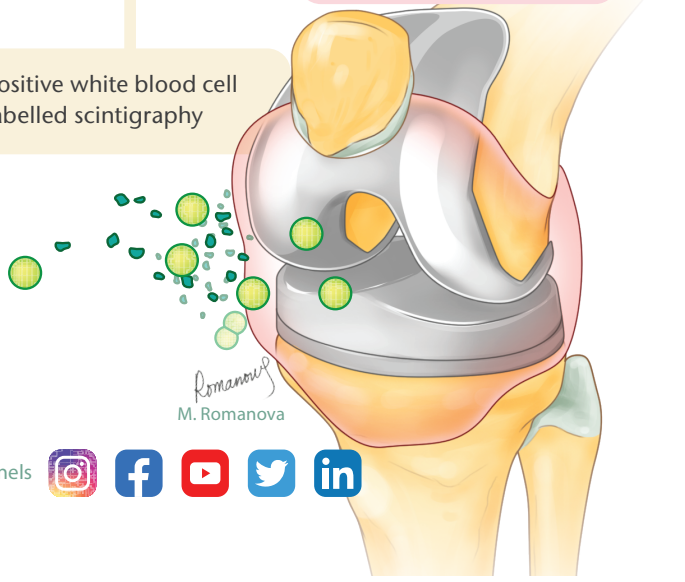
The Bone & Joint Journal
70 years of publishing excellence

# The EBJIS definition of periprosthetic joint infection

McNally et al. Bone Joint Journal, January 2021

European Bone & Joint Infection Society EBJIS

| | Infection Unlikely | Infection Likely | Infection Confirmed |
|---|---|---|---|
| | *All findings negative* | *Two positive findings* | *Any positive finding* |
| | A ✗ B ✗ C ✗ | A ✓ B ✓ or A ✓ C ✓ | A ✓ or B ✓ |
| **A CLINICAL** | | | |
| Clinical features | Clear alternative reason for implant dysfunction | • Early radiographic loosening<br>• Wound healing problems<br>• Recent fever/bacteraemia<br>• Purulence around prosthesis | Sinus tract communication with the joint +/- visualization of prosthesis |
| C-reactive protein | | • CRP > 10mg/l | |
| **B LABORATORY** | | | |
| Synovial fluid | • Leukocyte count ≤ 1500<br>• PMN ≤ 65% | • Leukocyte count > 1500<br>• PMN > 65% | • Leukocyte count > 3000<br>• PMN > 80%<br>• Positive Alpha-defensin |
| Microbiology | • All cultures negative<br>• No growth on sonication | • Single positive culture (aspiration or intra-operative)<br>• > 1 CFU/ml any organism on sonication | • ≥ 2 positive samples with the same microorganism<br>• > 50 CFU/ml any organism on sonication |
| Histology | Negative | Presence of ≥ 5 neutrophils in a single HPF | • Presence of ≥ 5 neutrophils in ≥ 5 HPF<br>• Visible microorganisms |
| **C RADIOLOGY** | | | |
| Nuclear imaging | Negative 3-phase isotope bone scan | Positive white blood cell labelled scintigraphy | |



M. Romanova

ESGIAI ESCMID STUDY GROUP FOR IMPLANT-ASSOCIATED INFECTIONS
European Society of Clinical Microbiology and Infectious Diseases

Find us online at bjj.boneandjoint.org.uk/ and via social media channels