



Portable Point-of-Care Synovial Fluid pH Measurement for Rapid Diagnosis of Periprosthetic Joint Infection

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1 BACKGROUND AND CLINICAL EVIDENCE

Background

Periprosthetic joint infection (PJI) is a serious complication of total joint arthroplasty. Synovial fluid pH reflects the local inflammatory microenvironment and has shown promise as a rapid adjunctive biomarker for infection diagnosis.

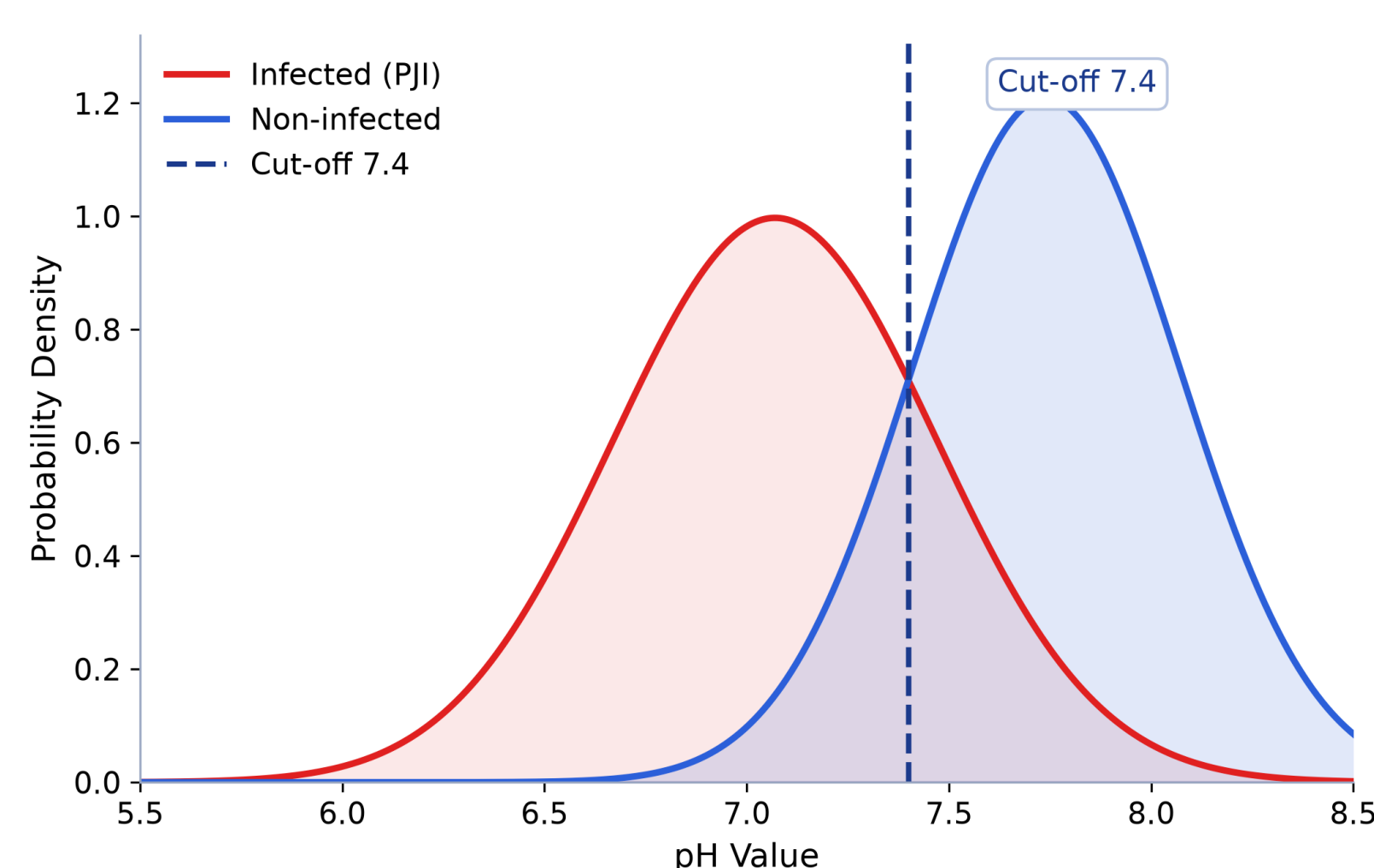
Clinical Study

- Prospective observational cohort
- 190 patients: THA 103, TKA 87
- PJI: 60 (31.6%); non-infected: 130 (68.4%)
- PJI classified according to MSIS 2018 criteria
- Synovial fluid pH measured intraoperatively or by aspiration

Key Findings

- Mean pH: 7.07 in PJI vs 7.74 in aseptic/ non-infected
- Median pH: 7.11 vs 7.78
- Cut-off: 7.4
- Sensitivity: 90.0%
- Specificity: 96.2%

Distribution of Synovial Fluid pH



Lower synovial fluid pH is strongly associated with periprosthetic joint infection. A cut-off of 7.4 shows high sensitivity and specificity for PJI detection.

Judl T, Popelka S, Tomšík E, Hrubý M, Daniel M, Fojt J, Melicherčík P, Landor J, Jahoda D. Acidity Is an Excellent Marker of Infection in Hip and Knee Arthroplasty. J Clin Med. 2024 Jan 25;13(3):688. doi: 10.3390/jcm13030688. PMID: 38337382;

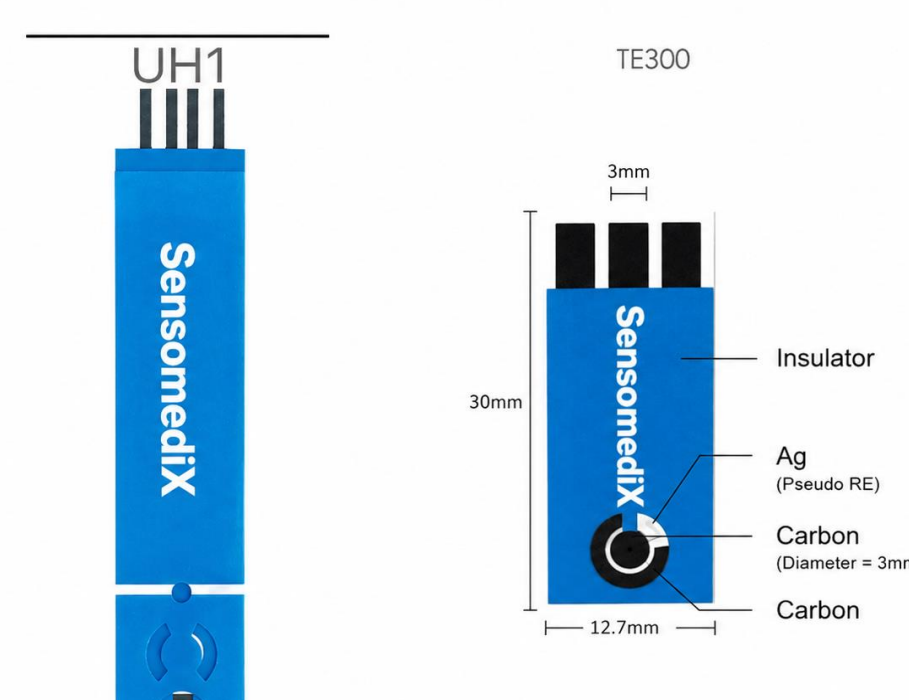


2 POINT-OF-CARE TRANSLATION

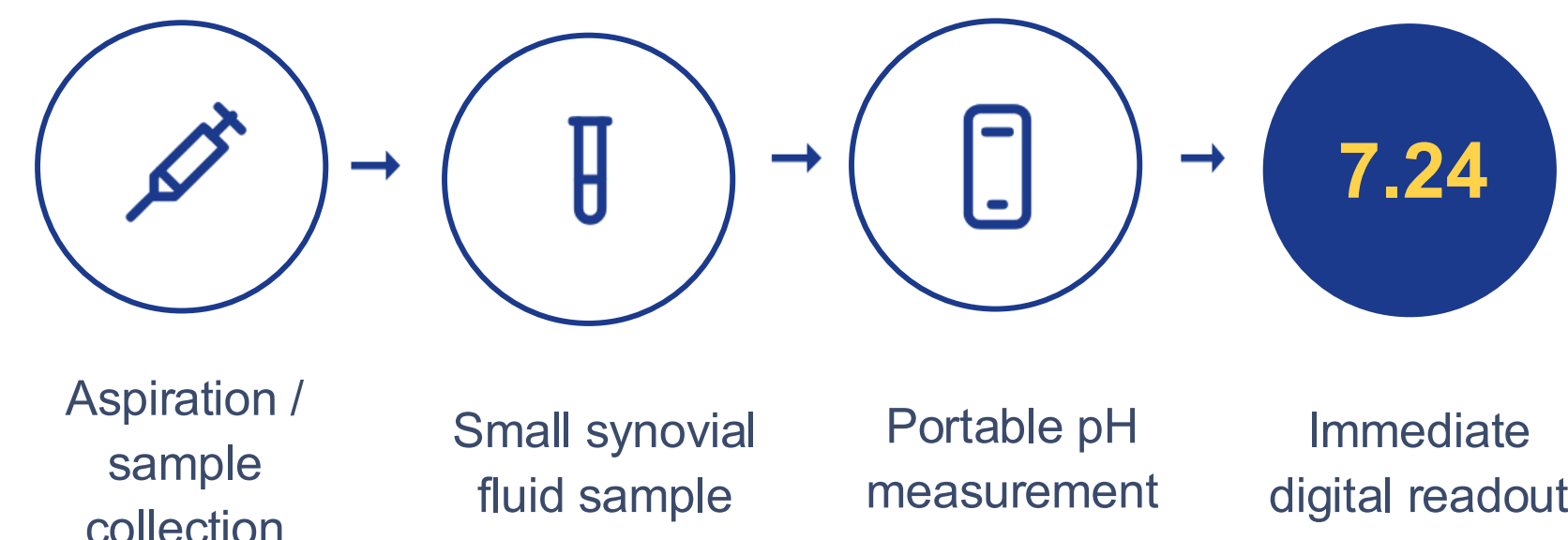
From Biomarker to Point-of-Care Device



Single-Use Disposable Sensors



Workflow



Prototype Concept

- Portable point-of-care platform
- Designed for rapid measurement
- Small-volume synovial fluid sample
- Bedside / outpatient / intraoperative use
- Translational step toward routine clinical implementation



3 CURRENT STATUS AND OUTLOOK

Current Status



The portable prototype has already been tested on a small sample set. However, the number of samples is still insufficient for statistically meaningful validation.

The diagnostic performance shown on this poster reflects synovial fluid pH as a biomarker and should not be interpreted as validated performance of the prototype device.

Why It Matters

- Potentially faster decision support
- Simple adjunct to current diagnostic algorithms
- May facilitate wider access to synovial pH testing

Next Steps

- ✓ Analytical verification of the prototype
- ✓ Prospective clinical testing
- ✓ Multicenter validation
- ✓ Integration into future smart orthopaedic solutions

Conclusion

- ✓ Synovial fluid pH provides a rapid and biologically plausible adjunctive marker for the diagnosis of PJI, with clear separation between PJI and aseptic/non-PJI cases in this cohort. Translation into a portable point-of-care platform could support faster clinical decision-making from small synovial samples at the bedside, outpatient clinic or operating room. Further analytical verification, prospective clinical testing and multicenter validation are required before routine implementation.



Clinically evaluated biomarker. Prototype under validation

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