

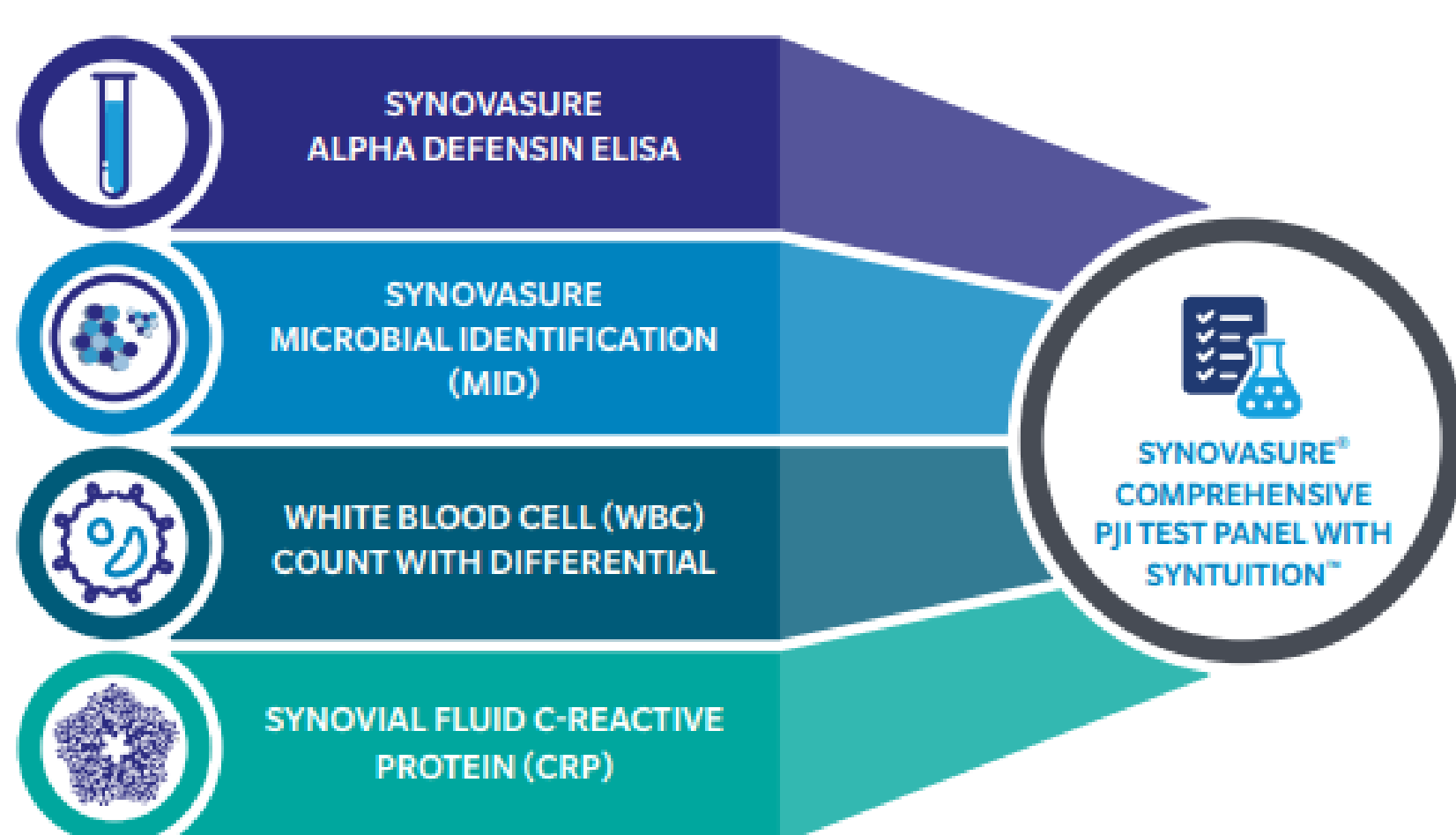
# Laboratory-Based Machine Learning Algorithm Reduces Economic Burden by Enhancing Diagnostic Accuracy and Clarity in Periprosthetic Joint Infection

Thai-Paquette V<sup>1</sup>, Parr J<sup>2</sup>, Worden A<sup>3</sup>, Toler K<sup>3</sup>  
<sup>1</sup>Zimmer Biomet, Claymont, Delaware, United States;  
<sup>2</sup>Zimmer Biomet, Swindon, United Kingdom; <sup>3</sup>Zimmer Biomet, Warsaw, Indiana, United States  
 Funded by Zimmer Biomet

## OBJECTIVES

Periprosthetic joint infection (PJI) diagnosis remains complex, with erroneous application plus implementation challenges of the current standard of care (SOC) methods. Diagnostic uncertainty may default to unnecessary two-stage revision surgeries and antibiotic overuse.

This analysis assessed the potential economic impact of integrating the SynTuition™ machine-learning (ML) algorithm, which interprets synovial fluid biomarkers from the Synovasure® Comprehensive PJI Test Panel, into the diagnostic pathway from a U.S. payer perspective.



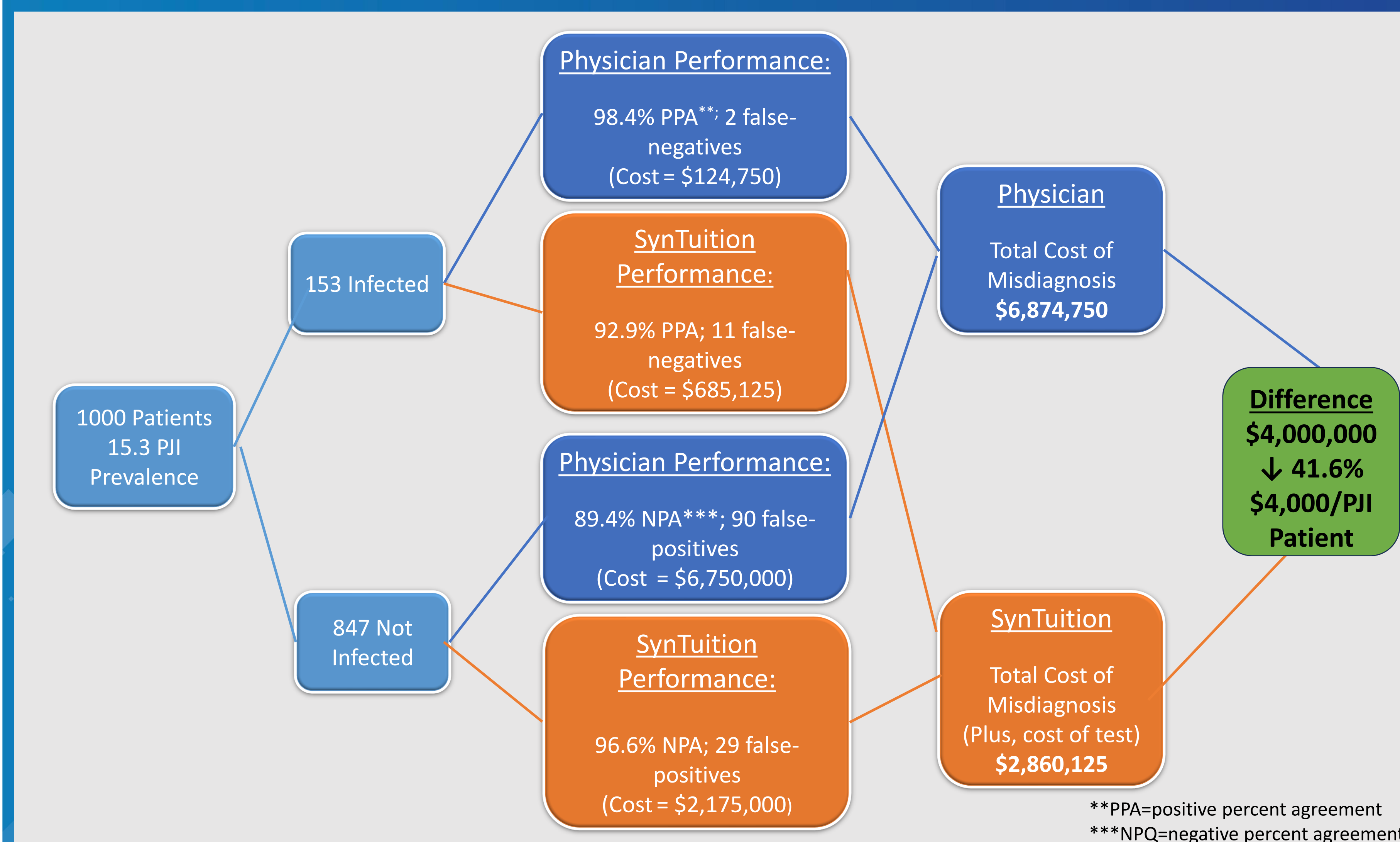
## METHODS

A decision-analytic model simulated 1,000 suspected PJI evaluations.

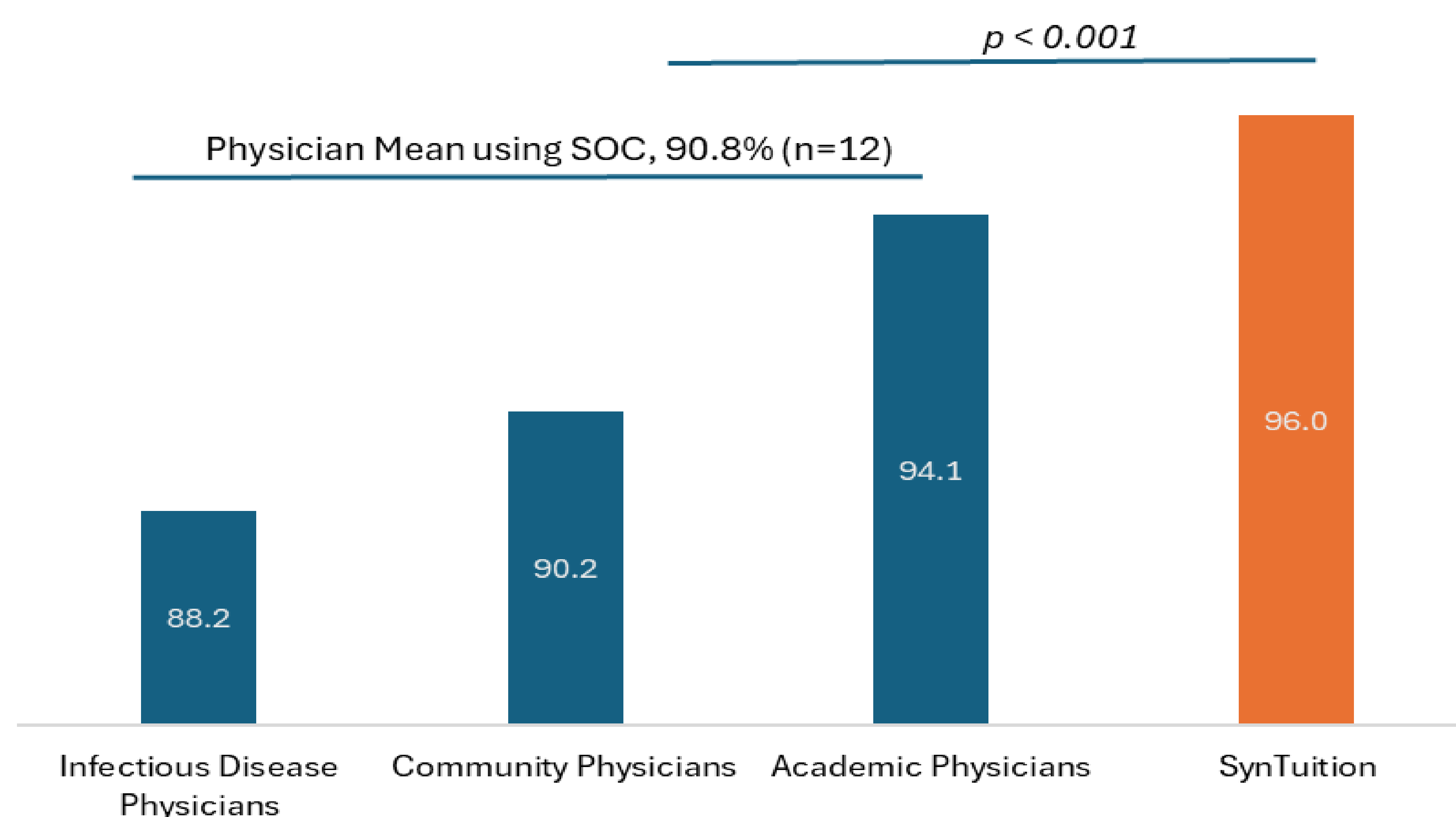
Modeled misdiagnosis costs were compared between a panel of physicians and SynTuition using diagnostic performance assessed against the SOC 2018 International Consensus Meeting (ICM) criteria, with inconclusive cases adjudicated by expert physicians.

# SynTuition™\* reduces the overall economic burden of misdiagnosed PJI by \$4000 per suspected PJI patient compared to a physician panel

Costs schematic comparing SynTuition to the current standard of care by a physician panel



## Overall Percent Agreement with Reference Standard



Scan to access the full article.

Parr, J.; Thai-Paquette, V.; Worden, A.; Baker, J.; Edwards, P.; Toler, K.O. Machine Learning-Driven Probability Scoring Enhances Diagnostic Certainty and Reduces Costs in Suspected Periprosthetic Joint Infection. *Diagnostics* 2026, 16, 626. <https://doi.org/10.3390/diagnostics16040626>

\*SynTuition is available as a laboratory-developed test (LDT). SynTuition is not available in New York State.

For product information, including indications, contraindications, warnings, precautions, potential adverse effects and patient counseling information, see the instructions for use; visit <https://www.zimmerbiomet.com> for additional product information. (c)2026 Zimmer Biomet.

## METHODS

Disease prevalence was 15.3%.

**False Negative:** \$62,375 (50% repeat testing \$1,000; 50% revision \$123,750)

**False Positive:** \$75,000 (Unnecessary revision)

## RESULTS

- The inconclusive rate and diagnostic accuracy was 22.9% and 90.8% by physicians and 0.4% and 96% by SynTuition, respectively.
- SynTuition demonstrated greater ability to accurately differentiate diagnostically ambiguous results compared to physicians. When cases were labeled *inconclusive* under current diagnostic criteria, physicians remained uncertain 38% to 48% of the time. SynTuition provided a definitive answer for all cases and correctly classified 86.7% of them.
- Physicians predominantly defaulted to a false-positive diagnosis in inconclusive cases, leading to lower overall accuracy.
- Compared to physicians using SOC, SynTuition reduced false-positives and overall costs from nearly \$6.9M (92 errors) to \$2.8M (40 errors).

## CONCLUSION

Implementing SynTuition to aid diagnosis of suspected PJI reduced the rate of false results, particularly false-positive results, which can lead to unnecessary two-stage revision surgery and high-dose systemic antibiotics.

## CLINICAL SIGNIFICANCE

SynTuition, overall U.S. payer costs were reduced by over 50%, amounting to an estimated net savings of \$4,000 per suspected PJI.